SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME XIX AUGUST, 1914 NUMBER 2

FRACTURES NEAR JOINTS

BY HARRY M. SHERMAN, M. D.

AND

FRACTURES INTO JOINTS[1]

BY HARRY M. SHERMAN, M. D., F. A. C. S., AND DUDLEY TAIT, M. D., F. A. C. S., SAN FRANCISCO

PART I — FRACTURES NEAR JOINTS

THE occurrence of a fracture in one of the long bones near a joint develops mechanical conditions different from those present when the fracture is in or near the middle of the bone, and the fracture near a joint is specialized by being in a region where both the anatomy and physiology are relatively complex. The short fragment and the mobile joint are elements difficult to manage in the treatment, in order to attain accurate alignment of fragments and retain normal joint mobility in the result. A study of these difficulties is always in order, and it is the more important because some of them are new or, at any rate, new to us, though they have, in point of fact, existed from the beginning of our present anatomical epoch. The discovery of new elements in the condition-complex of an old and customary fracture necessitates modifications in the plans of treatment which we have inherited from our surgical forebears, or the elaboration of wholly new methods, and everywhere surgeons are working out variations in old or devising new technique founded upon the clearer concepts of lesions and the newer surgical methods of to-day. These variations and innovations have the same fate as those constantly occurring in nature: some are useful and are perpetuated, others are useless and are abandoned. In studying some of the useful variants I have noticed a common element in them, seen practically in all, and have accepted it — rightly, I think — as the dominant characteristic and the one which makes the method a good one and gives it reason for existence. In all there has been the selection — independently by a number of different surgeons — of a definite position for the fractured limb, and in each instance and in the various joints it has been at the normal limit of motion in the direction in which motion is most difficult to regain after healing under the older classical methods. That this dominant characteristic is necessarily a position rather than a method of dressing I think I can explain by an observation I made some years ago and reported at the time. I had charge of a little boy with an open supracondyloid fracture of the humerus. It was just at the time when discussion of the cause and means to prevent gunstock deformity after this fracture were rife, and I took the opportunity of studying the parts, by finger and eye, through the wound. I was impressed by noting that in all the manipulations the *small fragment, representing the humeral condyles, bound by*

[1] Work done in part in the Surgical Research Laboratory of the University of California.

the forearm muscles and elbow-joint ligaments to the ulna and radius and attached in no way to the shaft of the humerus, was mechanically and for purposes of therapy a part of the forearm. Its position could be controlled or changed only by and through the forearm, and every attempt to immobilize it in its proper relation to the major fragment presupposed or demanded control of the position and disposition of the forearm. What is true of one joint must be true of all when a mechanical condition common to all is under consideration, and in all instances of fractures near joints, where the minor fragment is more firmly fixed by joint structures and other tissues to the segment of the limb beyond the joint than it is to the major fragment, some position of the segment of the limb or of the whole limb must be found for the proper alignment of the fragments and for their maintenance in that position. I have been so impressed by this fact that I believe it may be classed as one of the laws in the management and treatment of juxta-articular or intra-articular fractures; that it is applicable and operative in several instances can be demonstrated, and that it may be found applicable and operative in others seems, to me, not unreasonable.

Since the time when I studied my patient's supracondyloid fracture, Mr. Robert Jones of Liverpool has introduced the method of treatment in which the forearm is put in a position of complete flexion on the arm as the dominant point. In this position the forearm falls into a perfectly natural relation to the arm, the lesser fragment of bone is held by forearm muscles, elbow-joint ligaments and the interlocking of the bony parts, in a perfectly natural relation to the forearm and therefore to the arm, and the whole region is in the encompassing sling made of the muscles, fasciæ and skin on the extensor side of the joint. If proper reposition of the fragments has been attained, the single act of putting the forearm into a position of complete flexion on the arm and keeping it there accomplishes the act of redressment and maintenance of the normal relation — so that union finds restored natural alignment, a normal anatomy.

But this is not all, for in this particular joint the method has other advantages. Upon the removal of the dressings from an arm, fractured thus but treated in the ordinary way, flexed to a right angle at the elbow, this joint is found to have but a limited range of motion. It can be flexed a little past the position of right angle flexion and extended a little beyond the same position, but it is capable of neither complete flexion nor complete extension. Of course, the range of motion at once begins to increase, especially if attempts at forcing it are *rigidly excluded*, but it increases in extension far more rapidly than in flexion. The reasons are two. First: The oblique line of fracture in the bone has approached much more nearly to the capsule in front than it has in the back, and reparative callus can encroach much more on the space in the flexure of the joint than it can on the extensor surface, so that the room required for the act of flexion can be filled up and flexion can be prohibited. Second: In the erect position in which our waking hours are spent, the act of flexion is an active effort against the force of gravity and the gain in flexing can only be attained in this way. Gravity, however, is constantly aiding the act of extension and is in operation even if all the muscles of the arm are at rest. Hence it is that the individual has to approach his hand to his collar and his mouth with effort and patience. But in the arm treated in the position of complete flexion the reparative-material obstacle to flexion does not exist; the hand is already capable of reaching both mouth and collar and can at once begin its service; again, the act of extension has much less, if any, reparative-material obstacle, and gravity is always in operation to help. But even with the opposition of gravity eliminated, or without its aid, the right of way for the least easily recovered motion has been assured from the beginning and other motions are readily secured, so that union finds conditions all favorable to an early resumption of full function, a normal physiology.

At the other end of the humerus, the upper end, a fracture through or below the tuberosities or through the anatomical neck so

disposes matters that we have to deal with a short ungraspable minor fragment, rotated outward and abducted by scapulohumeral muscles and, if unimpacted, wholly free from the major fragment. The major fragment may be in any indifferent position, but quite ordinarily its upper end is below and internal to the minor fragment. Recognizing the conditions special to the joint, devices have been presented for meeting them, changing old time methods of treatment. Cotton records Mitteldropp's triangle, the Osgood and Penhallow splint and Monk's triangle, and all of these conform to this condition: that the minor fragment of the humerus, bound by muscle and ligament to the scapula, is for the time mechanically a part of the scapula; that the major fragment, to recover control of it, must follow the minor fragment's movement to the anatomical limit of shoulder joint abduction and rotation. Even a limited experience with upper humeral fractures will teach that this is a difficult, or for a long time impossible position for an arm that has been dressed in the more conventional position,— that is, by the side and rotated in with the forearm and hand across the upper belly — for if coaptation of the fractured parts has not been secured and maintained the components of the joint are already in abduction, and further motion in that direction is markedly limited so that to lift the arm from the side scapular rotation must be called into service long before it need be in normal joints. Not only is this true immediately after healing, but it must remain true so long as the adduction deformity at the point of fracture persists and this will be always unless some operative correction of it be undertaken.

Since writing this part of this paper — more than two years ago — I have had to treat several fractures of the humerus at this point in which coaptation of fragments was not possible without an incision. In each of them I found no difficulty in getting anatomical alignment when dealing with the bones directly, but I found more, for once coaptation had been secured and the fragments pressed well together they remained thus, artificially partly impacted without any internal fixation device, and I could then dress the arm in the conventional by-the-side position, and at the same time feel confident that full normal abduction at the shoulder joint would be easily and early a possibility. This seemingly negatives the postulate of the paper — that the limb must be in the position most difficult to attain after conventional and older plans of treatment, but it does so only by going beyond it and with full recognition of the anatomical and surgical factors present.

At the hip-joint, fractures of the femur have various values depending upon the location and direction of cleavage lines and also upon the age of the patients. From the view point I have assumed we can at once exclude impacted fractures of the femoral neck in the middle aged and old. The impaction clearly retains the femoral head as a part of the femur. In non-impacted fractures at all ages, the minor fragment, bound by no muscles and perhaps by but a part of the capsule to the major fragment, cannot be controlled by manipulation of the femur without taking the untorn capsule into consideration. At the same time its relation to the pelvis is equally tenuous. Ordinarily, under the pull of the pelvi-trochanteric muscles the major fragment will be dragged cephalad and will also, by its weight, rotate outwards. It will, in these movements, abduct and rotate *inwards* the minor fragment. Now this minor fragment, the head and part of the neck, comprises the essential of the femoral components of the articulation, and with it already in abduction when healing begins there is no possibility of abduction for the limb when healing has been completed; certainly not if the limb has been treated in the ordinary way in the ordinary position. Often I have tested this point, and have invariably found marked limitation to abduction after well managed and well healed femoral neck fractures. The little un-get-at-able piece of bone is the crux of the situation; the major fragment must go to meet it, and to do that the limb must be put into abduction until the trochanter rests against the rim of the acetabulum — maximal normal abduction. In this position the untorn capsule pulls tight and embraces the broken ends of the fragments, putting them into something very

like natural alignment. Healing under this postural method finds the femoral neck in about the normal relation to the shaft and the limb capable of normal abduction, an act which is, as I have said, impossible if union had occurred with the minor fragment abducted and the major one adducted. I am impressed with the method though from a limited number of observations, its chief disadvantage being its restricted application to patients; for those who cannot tolerate bed life cannot be treated by it, but must be content with a method which treats the patient rather than the fracture. To those who are suitable it gives most excellent results by putting the limb in a position which is the normal limit of motion in the direction in which motion is most difficult to regain after treatment by the more conventional method.

While impaction of a fractured femoral neck in the old is a sacred thing not to be lightly broken up by heavy hands, the same in the young has a different value. If it persists, normal abduction is for all time lost, for the minor fragment already is abducted and the major fragment adducted at the point of fracture. If, under proper anæsthesia, the limb is at once put into this prohibited position, normal abduction, the impaction is broken and the fragments then behave as if there had been no impaction, the position most difficult of attainment is secured from the beginning and the final result is, anatomically and physiologically, the nearest approach to the normal.

The most common fracture at the ankle-joint is the one least commonly properly treated. I am sure that Pott's fracture suffers by the very reason of its commonness. We all think we can easily treat it. I am, however, bound to acknowledge because of the many ill-treated cases that I see, that it is a wholly misconceived lesion. Few stop to think of the lesion-complex which contains four distinct elements, and fewer still stop to recollect the importance of the joint and the great amount of force put upon it; for an ordinary man running or jumping in a not extraordinary manner develops a force of more than 600 pounds upon the top of his astragalus. The great importance of getting anatomical restitution is, therefore, made obvious.

I have been, for many years, in a small way a clearing house for these cases and I find the people, a few months after the fracture, with a limited ankle-joint motion range which can be understood because of the ankle-joint involvement. But I find them also with a pronated foot and one quite incapable of supination. Now this motion occurs not at the ankle-joint but at the subastragaloid-joint, which is not more than secondarily implicated in the lesion; but, if the ankle-joint is dressed in an abnormal position of pronation the normal amount of supination at the subastragaloid-joint cannot compensate for it, least of all in such times of stress as when more than a quarter of a ton of weight is put on it. In the lesion the minor fragment, that is, the internal malleolus, is attached to the foot by the internal lateral ligaments of the ankle-joint and is wholly free from the major fragment, and it is, for all practical purposes, a part of the foot. Control of this minor fragment can only be secured by and through control of the foot. To approximate the minor to the major tibial fragment means that the foot must be dressed in a position of full normal supination. Other details, such as keeping the foot in a position of work, at right angles to the leg, and the correction of possible luxation forward of the foot on the leg, and also the correction of the widening of the malleoli, due to rupture of the tibiofibular ligaments, must not, of course, be forgotten; but the major point in the treatment of this common lesion is to put the foot, at the beginning, in the position which it later usually finds it impossible to assume, a position which approximates the minor fragment to the major fragment, the position of full normal supination. With this forgotten and all the rest remembered, a disappointing result may be expected; with this remembered and all the rest forgotten, a practical foot is still attainable.

Quite recently I have been able to apply this principle to the treatment of a fracture just behind the head of the proximal phalanx of the thumb of a little girl. The fracture was an extension fracture and the parts had

partly united in this malposition. Flexion of the distal phalanx was impossible and an incision was needed to separate the forming union. The parts were dressed with the phalanx in flexion and the result has been most satisfactory.

Beginning the study of the lesions I have mentioned at the point where our surgical ancestors left us, and departing from older classical methods in the light, more especially, of radiographic demonstration, independent workers have devised these new plans — Mitteldorpp, Osgood and Penhallow, and Monk at the upper humeral, and Jones at the lower humoral fractures, and Whitman in fractures of the femoral neck — and all have, perhaps unconsciously, conformed to the proposition that the limb in the new method is put at the normal limit of motion in the direction in which motion is most difficult to attain after older classical methods. There is but one unavoidable qualification: the position must be one which secures and maintains normal alignment of the fragments, and for the fractures I have mentioned this qualification is properly met.

One more fracture may possibly be added, though purely on *a priori* ground, and that is fracture just above the femoral condyles. It is conceivable that such a fracture, once it has been properly reduced, could be very easily kept in place by flexion of the knee. Reduction without an incision, however, is difficult because traction on the leg is lost in the long muscles which pass from the tibia to the pelvis and affects the minor fragment but little. Reduction through an incision is relatively easy and then the normal treatment at the present time is to use internal fixation methods such as screws and plates or staples, so that the positional method has had no opportunity of trial. If internal fixation methods are not available, and if proper reposition of fragments can be secured, the positional method is, I think, one that can be legitimately tried.

In addition to the list of fractures here given there must be considered the whole class of epiphyseal separations. These are necessarily fractures near joints and they are also fractures in which the minor fragment has less attachment to the major fragment than it has to the other bone component of the joint. They are fractures in which normal alignment can commonly be maintained once a proper reposition has been secured with the parts in conventional position; but they are, I know from experience, fractures which respond readily to the plan outlined in this paper, and with the parts put at first in the position which usually is difficult to attain, reposition of fragments will be easily kept, healing will occur normally, and full function will be most readily and quickly regained.

Instead of citing specific epiphyses and particular joints I put this general statement concerning the whole class into this separate paragraph for the purpose of emphasis.

The placing of internal fixation apparatus, steel plates, or screws or staples to hold the fragments in the case of a fracture near a joint, opens two questions, the first relates to the firmness of the hold on the fragments, the other relates to the effect on the mobility of the joint. There is still not a little vagueness in our ideas of the mechanical value, especially in point of time, of screws penetrating the bone. All who have had to take out plates — and that includes practically everyone who has put them in — testify variously as to the firmness of location they found. A couple of years ago Willard Bartlett, in a most interesting paper before the Section on Surgery of the American Medical Association at the Los Angeles meeting, testified to the surprising amount of force that was required to pull from the relatively light bones of the dog freshly placed or recently placed screws. His experiments related to screws placed in the diaphyseal cortex, and some of them were intentionally infected while some were not so. The point to be made here is that they were all idle screws — screws that held no plate, on which no weight came, that were doing no work. It seemed to me that there was such a difference between this idle screw and the screw on which a weight hung that the following experiment was done. In the femur of a medium-sized dog two screws were firmly set about 2.5 cm. apart. A light elastic band was then placed around them, so that a little pull was

constantly made by the rubber. The wound was closed. After a time, when the wound was opened, both screws had been drawn from their holes by the elastic; the tissues of the living bone had been absorbed under the pressure generated by the pull of the elastic and the screws had lost their hold. Now screws placed in the cancellous tissue of the bone ends have, primarily, a less firm hold than have those in the cortex of the mid-shaft, and, secondarily, absorption around them must take place more rapidly for the total amount of bone in contact with them must be less than it would be in the shaft, therefore, the expectation of work from them must be lessened both in amount and in time. Screws and staples have, therefore, but the value of temporary coaptation methods and the real support and control of the parts must be arranged for by a proper splint, an external retentive apparatus.

The proximity of a plate or a screw to a joint cuts no figure provided there is no infection and the screws are not in the way of the moving parts of the joint, the tendons, ligaments, and bones. Lane pictures a plate running down to the tip of the internal malleolus with a screw in its end hole. Screws have been put into the olecranon. I have put a silver band 1.5 cm. wide around the femur just above the condyles, in which position it lay beneath tendons and blood-vessels and nerves on the posterior surface and the extension of the synovial membrane upwards on the anterior surface. For seven years this has stayed in place on a limb actively engaged. Provided that moving parts are not interfered with and no infection is present there need be expected no extension of reparative inflammatory processes to the joint producing an ankylosis, though it is quite to be expected that such a joint shall be somewhat stiff when it is first taken out of its splints, due to splint restraint and disuse. This will naturally pass away and joint function will be regained provided the moving parts of the joint are not encroached on by the foreign bodies.

Part II — Fractures into Joints

Fractures which enter joints affect not only the anatomy of the bone but also the physiology of the joint, and not only may they upset the joint surfaces so as to mechanically interfere with normal motion, but they may excite adhesive inflammatory processes in that unstable connective-tissue structure, the synovial membrane. Leaving out of consideration, for the moment, the more serious fracture lesions of joints we shall see how many of the ordinary ones fall easily under the rule which has been formulated. We have only to think of fracture of the humeral external condyle, in which the minor fragment — which includes not only the capitellum but commonly part of the trochlea — is pulled downward and forward by the supinator longus and, healing in this position, offers a distinct obstacle to the radial head in the motion of flexion. But this same fragment is pushed upward and backward into its proper place by the radial head if the elbow is dressed in full flexion, and healing then offers no obstacle to flexion. In fractures of the carpal scaphoid, a little bone over which many of us may stumble, Mr. Robert Jones says: "The main disability consists in a loss of the power of extension. We, therefore, at once secure our right of way by hyperextending and fixing the wrist in hyperextension." "If such a case be seen early and the wrist be hyperextended and kept in that position for about fourteen days an excellent functional result can be assured."

Some of the fractures I have already instanced, for example, fracture of the femoral neck high up and Pott's fracture, enter joints but neither of them call for a fixation plate or screw on the articular surface or near it, both being amenable to extra-articular intra-osseous apparatus if any is needed.

In the cases where fracture lines so upset joint surfaces that mechanical obstacles are set in the way of motion, and where neither positional methods nor splints are efficient in holding fragments in place, one's mind naturally turns to the use of internal fixation methods. Are screws and plates tolerated

inside a joint? Would it be right to put them in a joint, and, if so should they be kept off the articular surfaces or could they be placed on the articular surfaces, even on the bearing areas of such surfaces?

In 1890, Charles Phelps [1] of New York reported a series of cases of fractures of the patella treated by longitudinal ligation with silver wire. On the articular surface the wire was laid in a groove cut in the cartilage for its reception. Phelps stated, without clinical or post-mortem proof, that the wire would be "covered in and cause no subsequent trouble."

A careful search of surgical literature fails to reveal other instances of intra-articular fixation appliances.

We, therefore, decided to submit the problem to the test of experiment. In the first place we recognized that joint cavities have, until the last decade or so, been shunned by surgeons on account of their relatively lower resistance to the minimal infection. This probably is due to the fact that the synovial membrane has no endothelial surface, as has the peritoneum, but merely a layer of laminated connective-tissue, so that its power of dealing with infection is far inferior to that of the peritoneum. Modern surgical technique, which has taught us manipulation of parts without hand or even glove contact, has overcome the objections which lay against an operation where direct handling was necessary; and experience has shown that joint cavities, like all other body cavities, could be and were entered safely with proper precautions. The recent work of Handley [2] on the reposition of epiphyses and Hallopeau's [3] monograph on the treatment of juxta-articular tuberculosis illustrate the tendency to reconsider the generally admitted risks involved in the opening of joints.

We selected dogs and cats as the most suitable animals for this work and the knee-joints as the best joints — using one knee at one séance and, if all went well with it, the second at a subsequent séance. The hair was removed by a depilatory and the field then painted with 3.5 per cent tincture of iodine. The skin was incised longitudinally in the median line, directly over the quadriceps tendon which was retracted laterally, carrying with it the patella; the joint was then entered by an incision external to, and parallel with, the tendon. These incisions were practically bloodless. The U-shaped incision had much to commend it, but it had the disadvantage of cutting the patellar ligament. The femur was the preferable bone but in some instances the tibia was chosen. In the joints we used screws of steel, of plated steel, and of brass, and in some instances we put in small plates of annealed clock spring with brass or plated screws. In one dog an autoplastic bone peg was used — cut from the tibia. An effort was always made to sink the screws so that the head was flush with the surface of the cartilage, and if a plate was used the cartilage was cut away so as to countersink both plate and screw, but this was often difficult because of the small size of the joints and the thinness of the cartilage. Closure of the wounds was by catgut or silk or linen for the capsule of the joint and linen or silk for the skin, using the Willard Bartlett stitch for the latter. The incision was painted with iodine; neither dressing nor splint was used. In all of the eighteen experiments Lane's technique was followed, the tissues being disturbed as little as was possible.

In the earlier experiments the screws were put outside the limits of the articular cartilage, through the cortex on the side of the bone, but within the capsule. In some instances a condyle was cut loose except for the periosteal attachments and then fastened again into place by a lateral screw. In most of the experiments, however, the screws, staples, etc., were put through the bearing area of the articular cartilage.

When screws were placed on the cartilage, both the early and the late effects varied with the degree of success of the countersinking of the screws.

Early effects with well countersunk screws. During the first three or four days there was very slight swelling of the joints, which

[1] N. Y. M. J., 1890, li, 597.

[2] Six months after the present experimental work was begun, Handley, of London, reported a case of trans-articular reduction of an elbow fracture and its maintenance by the use of a screw introduced through the shaft of the humerus to the fragment below. (Brit M. J., 1912, ii, 860.)

[3] Hallopeau. La desarticulation temporarie dans le traitement des tuberculoses du pied. Paris. 1913.

were tender to handling. The animals usually would walk some on the limb but with a limp. In some cases (dog and cat) as early as the fifth day the animal used the limb freely and almost invariably with no limp. (Fig. 1.) There was rarely any evidence of effusion, except in the earlier cases in which the technique was faulty and there had been too much traumatism of the parts. Even in these cases the aspirated fluid was sterile aërobically and anaërobically, excepting in one case of staphylococcus albus infection.

Early effects with insufficiently countersunk screws. In this group, function remained normal in the cases of slightly projecting screws or plates. With screws or plates projecting a one-half mm. or more into the joint cavity (Fig 2.), usually the animal refrained from using the limb; there was slight swelling, and tenderness was more marked than in the first group. In some cases aspiration showed a sterile, blood-stained, mucilaginous fluid. After ten to fourteen days, however, the animal began to walk limpingly on the limb and at that time there was rarely any evidence of effusion; arthritis was only noted once.

Late effects. In the first group the *joint was used as a normal joint.* The animal's gait became absolutely normal as early as the fourteenth day and remained so. (Figs. 3 and 4.)

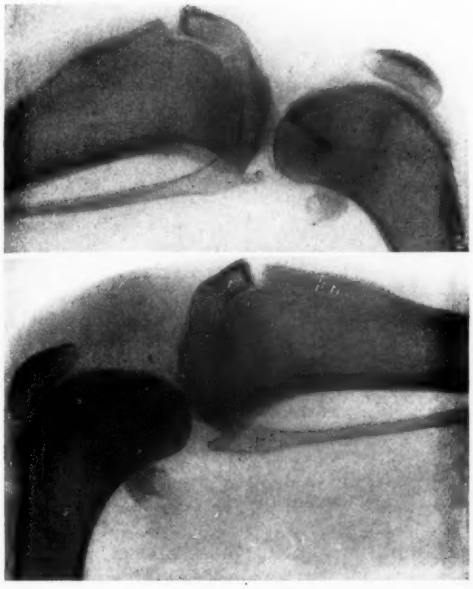
In the second group, function was normal in many instances; in other cases there was a slight limp for four to six weeks and sometimes this wholly disappeared. In the majority of cases belonging to the second group, however, the limp persisted but was less. In three limping cats killed during the third month, there was some evidence of arthritis, probably caused by the excessive size of the intra-articular screws. (Fig. 5.) Numerous necropsies from the third week to the sixth month proved that the tenderness of the joint and the disinclination on the animal's part to use the limb coincided with the time during which the screw was cutting away the opposite cartilage, and that when this had been accomplished, and the cartilages of both bones came properly in contact and the screw head bore no weight, the animal began to use the limb, the gait becoming normal very soon afterward. (Figs. 6a and 6c.)

HISTOLOGICAL DATA.

Joint Cavity: The introduction of screws, plates, staples, etc., invariably gives rise to a well-marked local reaction which does not differ in its essential features from the usual connective-tissue reaction to foreign bodies. Varying in extent according to the relation of the screws, etc., to the pressure-bearing cartilaginous surfaces, this reaction consists of a newly-formed fibrous tissue which rapidly covers the screw or plate and excludes it from the joint cavity. (Figs. 7, 8, and 9.) Dense on its free surface, the newly formed lamellated connective-tissue is of the loose, alveolar type in the deeper areas. The cells are elongated and arranged parallel to the joint surface. In some specimens the superficial cells resemble endothelial cells. Serial sections show clearly the growth of the connective-tissue arising from the marrow. There is no evidence of new-bone formation or of regeneration of cartilage. There are no other changes in the joint cavity.

When the screw or plate is insufficiently countersunk the reaction does not differ, except as to extent, from that above described: only the part which is free from pressure will be covered by the newly formed fibrous tissue. In some experiments the tissue filled only the groove in the screw-head; the uncovered part of the screw was polished by friction against the opposite bone and usually it had cut a path in the opposite cartilage through which it moved easily.

Bones. In the bones the local reactions were the same as with extra-articular screws and nails. Late observations (four months) show the screws and staples firmly embedded. In some instances their removal necessitated the use of the chisel. With an autoplastic bone peg (tibia), there was less reaction, but the peg was rapidly absorbed, so that an eight weeks' specimen showed only traces of it, its place being partly taken by new bone. In the cases where more than one metal or a plated screw was used, the staining of the bone around the foreign body would seem to suggest an electrical reaction.



Figs. 1 and 2. Dog, four months after operation, showing screw has been well countersunk. Gait was normal.

CONCLUSIONS FROM EXPERIMENTS

1. Dogs and cats offer exceptional facilities for the study of juxta- and intra-articular fractures.

Fig. 3. Dog, same as in Figs. 1 and 2, four months after operation, with one screw well countersunk and one not. The gait was quite normal, as shown in Fig. 4.

2. The trans-articular method is the only practical method which gives perfect access to certain joint fractures and permits accurate reposition of the fragments.

3. The innocuousness of the trans-articular route for the reduction of these fractures may be considered demonstrated.

4. There would seem to be a decided mechanical advantage in using intra-articular screws or screws and plates to insure the accurate maintenance of the replaced fragments.

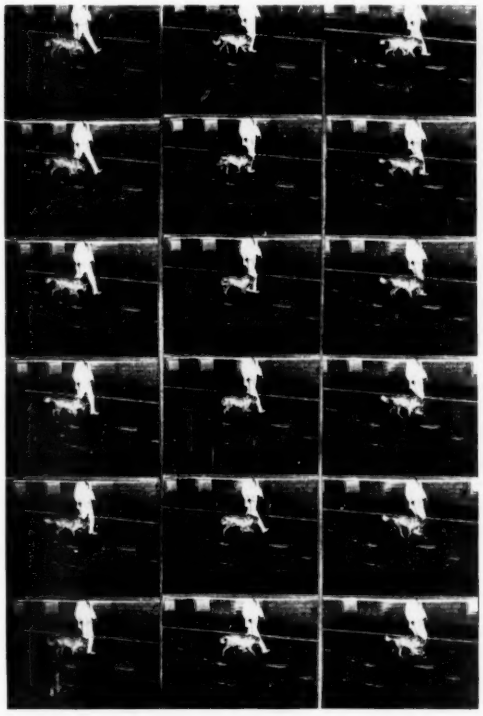


Fig. 4. Part of a moving picture film, which showed the dog jumping.

5. Screws and plates so used seem to be *per se* innocuous. Aside from the trauma incidental to their trans-articular insertion, the reaction following the introduction of screws and plates does not differ from that caused by a foreign body in other connective-tissues of the body. When properly counter-

Fig. 5. Cat, three months after operation, showing a screw disproportionately large and a permanent limp.

sunk they are rapidly excluded from the joint cavity by a layer of newly-formed fibrous tissue which grows up from the marrow spaces. Under aseptic conditions the ultimate fate of intra-articular metallic fixation appliances

Fig. 6 a. Fig. 6 b.

Fig. 6 a. Dog, four weeks after operation, showing poorly countersunk screw and a groove (1) cut in the opposite cartilage by the screw head. Slight limp.

Fig. 6 b. Dog, five months after operation, showing poorly countersunk screw, and a groove (A) cut in the opposite cartilage by the screw-head. No limp.

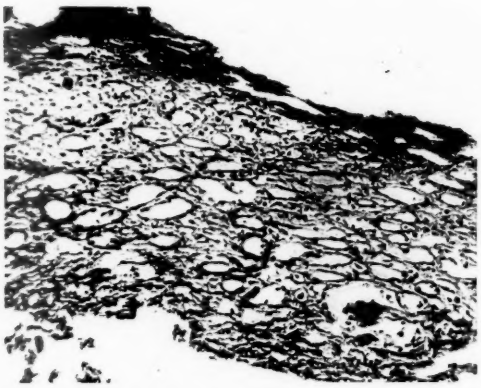


Fig. 7. Lamellated fibrous tissue covering intra-articular plate.

is the same as that of extra-articular appliances: they remain firmly embedded.

6. *Per se* the screws cause very little more reaction than the autoplastic bone peg.

7. The use of two different metals in the screws and plates does not change the result in the articulation, except so far as the possible electrical reaction is concerned in the staining of the tissues.

8. Even with slightly projecting intra-articular screws or plates, the function of the joint rapidly becomes normal. The direct wearing away of cartilage by an insufficiently countersunk screw head does not lead to intra- or extra-articular deformities, except under faulty technical conditions.

Experiments of this kind are, of course, of no value unless their results can be utilized in the treatment of fractures entering joints in man. So far neither of us has had occasion to use an intra-articular screw, and what has to be said on their applicability in man must be held to be theoretic — but neither of us would hesitate an instant to put a screw of proper size on any part of the surface of any joint, if the conditions seemed to require it.

In the experiments the joints were normal joints; in man they would, presumably, be traumatized joints and the reaction to the fracturing trauma would have to be considered — but we believe that even in the presence of trauma the trans-articular replacement and maintenance of the replaced

Fig. 8. Showing repair of a groove in the patella.

Fig. 9. Newly formed fibrous tissue springing from the marrow spaces and extending over the screw.

fragments or epiphyses by position or by screws will give a less totality of trauma than permitting the persistence of displacement with its consequent disability. We believe that the method of extending to intra-articular fractures the internal fixation apparatus used commonly in extra-articular fractures, will result in the saving of more useful joints. We recognize the full value of the need of absolute asepsis, and the grave dangers resulting from unnecessary handling of tissues in this work, and we agree in the opinion that screws, etc., should not be used in open fractures into joints as an immediate method, but they may be used at a later period after the external wound has healed and the joint is free from infection.

The trans-articular route is suggested as the method of choice in fractures traversing joint surfaces (or displaced epiphyses), when anatomical apposition of the fragments can not be maintained except by the use of some internal fixation apparatus.

TUMORS OF THE NECK

By F. E. McKENTY, M. D., F. R. C. S., ENG. Montreal, Canada

Contents: *Introduction.*
Embryology of the neck.
General morphology of pharyngeal pouches.
The ductless glands of the neck.
Branchiogenic Cysts: (*a*) General characteristics, clinical and pathological. (*b*) Reports of cases.
Branchiogenic carcinoma: ditto.
Thyroglossal cysts: ditto.
Carotid body tumors: ditto.

TUMORS of interest from an embryological or developmental point of view occurring in the neck are of great importance on account of their difficulty of diagnosis and their comparative frequency. The records of such cases dealt with in the Royal Victoria Hospital during the last ten years show the following:

A. Branchiogenic cysts..... 15
B. Branchiogenic carcinoma..... 5
C. Thyroglossal cysts..... 9
D. Carotid body tumor..... 1

In this paper we present a view of the present state of knowledge upon the embryology of the region in relation to the surgical pathology of the tumors and enter into a discussion of the difficulties of microscopic diagnosis and other points that appear worthy of comment in the series of cases tabulated.

Embryology of the neck. The pharynx and the neck of the human fœtus of the third and fourth week are very unlike the same parts in the adult. Indeed, at the third week the human pharynx generally resembles that of the fish. In each case the region is bounded laterally by visceral or branchial arches which are separated in man by depressions, in fish by clefts. In both, the heart is situated under the pharynx, while the ventral aorta gives off aortic arches that pass up on each side (one in each visceral arch) to join the dorsal aorta. In fishes the aortic arches give off vessels to the gills, in which the blood is arterialized; in the human embryo the blood passes directly through the aortic arches (Figs. 1 and 2).

It is with that part of the human neck lying in front of the vertebral column and between the

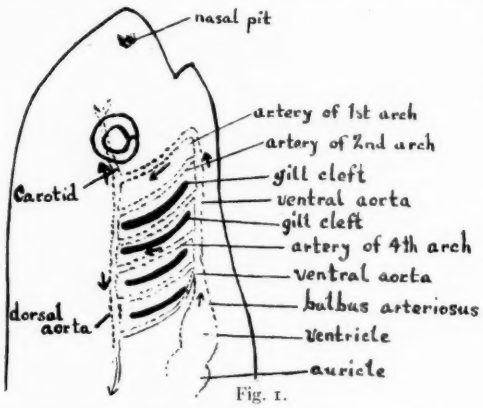


Fig. 1.

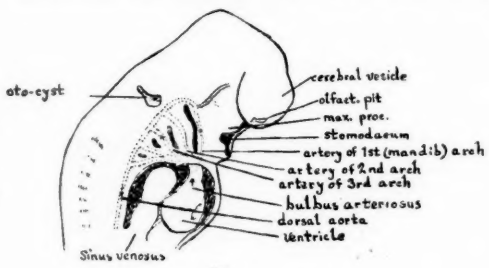


Fig. 2.

mouth above and thorax and clavicles below, bounded laterally by the transformed visceral arches, that we have to do in this paper. It is, therefore, necessary to discuss the mode in which the transformation from fœtal to adult form takes place. Not only is the peculiar course of the recurrent laryngeal and phrenic nerves, etc., so explained, but the occurrence of fistulæ, of cysts and anomalies of the thymus, thyroid, tonsil, and pharyngeal pouches becomes intelligible.

The branchial or visceral arches are described as five or six in number, according as the last is considered a true arch, for it never becomes raised or superficially differentiated from the body-wall behind. Sagittal and coronal sections of the primitive pharynx (Fig. 3) give a better idea of the arrangement and constitution of visceral arches than can be had from a surface view. They are developed around the most anterior part of the foregut, the primitive pharynx. The visceral clefts between the arches are lined by hypoblast which passes outwards between the arches to meet the epiblast of the external depressions, forming a closing or limiting membrane. This membrane consists exclusively of epiblastic and hypoblastic elements and never ruptures, far less disappears, in the case of mammals, whereas in fish it disappears thus forming real clefts between the arches. In the human subject we have on the side of the neck depressions — branchial furrows — corresponding with the pharyngeal recesses. (Figs. 3 and 4.)

Certain structures, to be described later, arise from the pharyngeal pouches, while various cysts and fistulæ met with in adults arise from the branchial furrows.

General morphology of the pharyngeal pouches. The rudiments of the pharyngeal pouches appear in succession and are formed earlier than the corresponding external branchial furrows. They grow out from the anterolateral part of the embryonic pharynx laterally and dorsally, being separated from their fellows of the opposite side by a groove — the ventral pharyngeal groove. Between the pouches the branchial arches develop as elevations projecting into the pharynx. These, with the exception of the first, fade away as they approach the midventral line into an area known as the area mesobranchialis (Fig. 3). The ventral parts of the pouches deepen to form a ventral prolongation or diverticulum, which are most distinct in the cases of the second and third. Sometimes the expansion of the ventral diverticulum of the second pouch goes on to rupture of the limiting membrane, with the result that a fistulous tract is established connecting the cavity of the pharynx with the surface. This may persist.

Normally, after the limiting membrane has been converted into an elongated strip, the mesoderm again penetrates between the epiblast and hypoblast of which the membrane is composed, the pouch becoming thus separated from the external cleft depression and the surface of the embryo. This process may be followed in its simplest form in the first pouch, [1] but in others it is associated with the

[1] Round the dorsal end of the first branchial furrow the auricle is developed from a series of tubercles which make their appearance in that region. Defects are of frequent occurrence in connection with this process and produce anomalies of the external ear, of which two cases have come under our notice during the past few months:

Case 1. With accessory tubercles on one side and absence of the external auditory meatus on the other side. Parents normal. See illustrations. Case 1, p. 144.

Case 2. With accessory tubercles in place of a pinna on each side. The father showed a like condition.

formation of the precervical sinus (Fig. 3), which is the probable source of many of the lateral dermoids of epithelial character found in the neck.

The precervical sinus is formed because the first (mandibular) arch and the second (hyoid) arch grow more rapidly than the rest of the arches. This more rapid growth takes place in all directions and has the result that the slowly growing caudal arches appear to sink into a depression — the precervical sinus. This at first is widely open laterally, but soon the posterior edge of the hyoid arch grows backwards over the mouth of the sinus to form an indistinct operculum. Under the edge of this operculum, the sinus retains for some time its connection with the exterior, the opening being known as the cervical duct. After a time the operculated edge

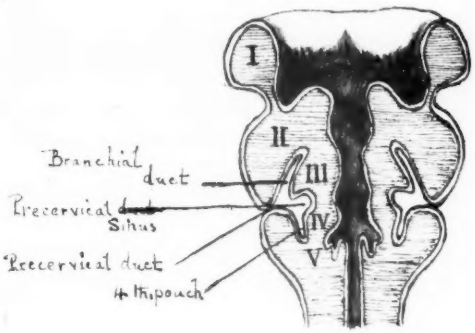


Fig. 3. Showing the formation of the precervical sinus, the branchial ducts and the precervical sulcus (Cunningham.)

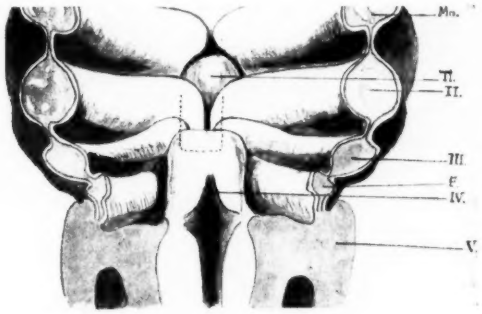


Fig. 4. Floor of the mouth and pharynx of an embryo of 5 mo. (After His.) F, furcula; Mn, mandibular arch; Ti, tuberculum impar; II-V, the branchial arches. The thyroid evagination is indicated by a dotted line.

of the hyoid duct fuses with the tissues of the neck, thus blocking the duct and enclosing an epiblastic sac, the "vesicula precervicalis." This little sac lies lateral to the third pouch, but is connected by diverticula with the external branchial furrows (ii-iv), which have become drawn out into long canals as shown in Fig. 3 (branchial ducts). Neither the vesicula nor the branchial ducts persist for long. Their lumina disappear, the epiblastic cells forming this disintegrate and vanish. It is obvious that any failure in these retrogressive processes must have the effect of leaving cells of an epithelial character buried in the neck, providing all that is necessary for the subsequent production of tumors.

It is not necessary for the purposes of this paper to enter fully into the history of the more caudally placed arches, but there are certain events taking place in their neighborhood of sufficient interest to justify brief reference. The epithelium of each of the three pouches which separates them gives rise to one or more ductless glands — the thymus (from ventral diverticulum of third pouches, also thymus rudiments from corresponding diverticulum of fourth pouches), the parathyroids (from third and fourth pouches), and the ultimo-branchial bodies (so-called lateral thyroid from the fifth pouch). (Fig. 5.) The fate of the ultimo-branchial bodies is unknown, but they are probably embedded in the thyroid gland. The developing ultimo-branchial bodies used to be regarded as lateral thyroid rudiments, but there is now little doubt that this view was incorrect (Verdun).

The development of the middle line of the neck now calls for description in more detail, in order that certain abnormalities in connection with the thyroglossal duct may be more clearly explained. An examination of the floor of the mouth of an embryo 5 mm. (Fig. 4) shows a rhomboidal depression in the median line between the ventral ends of the first and second branchial arches, and from these there rises a dorsal projection of rounded form, known as the tuber impar. Behind this is a deep epithelial (hypoblastic) pit which is the thyroid evagination (thyroid anlage). This grows out, expanding in all directions, especially laterally, to form a stalked vesicle whose lumen becomes obliterated later. Prior to its conversion into a solid epithelial cord the stalk of the vesicle constitutes the thyroglossal duct. The site of its opening into the mouth is marked in the adult by the foramen cæcum, which is in reality a short but varying length of the stalk of thyroid vesicle which has failed to solidify and disappear.

After the solidification of the duct the vesicle becomes bilobed and displaced caudally, eventually developing into a broad structure composed of irregular cords of cells. The ultimo-branchial bodies apply themselves to this mass and are, as indicated above, probably enclosed within it. The thyroid gland belongs, therefore, primarily to the medial region between the first two ventral pharyngeal grooves, and becomes displaced caudally until it reaches the position which it occupies in the full-term fœtus. This explains why the thyroglossal

Case 1. Defect in fusion of tubercles (right side). Photo by Dr. Geldert.

Case 1. Same case showing defect in formation of oral fissure.

Absence of external auditory meatus (left side).

duct, when it persists, usually runs posterior to or occasionally through the hyoid bone and why it is so difficult to remove it surgically (Fig. 6).

The carotid body, which was looked upon for some time as developing from the epithelial structure of the third pouch, is now definitely placed in the category of the chromaphil system. Further information with regard to its development will be found in the section on Carotid Body Tumors.

To sum up, the persistence of portions of the branchial system which normally disappear, gives rise to cysts, fistulæ, and tumors. The region corresponding to the ductus branchiales and the ductus precervicalis is found at the anterior border of the sternomastoid (figure). If the development of vessels be normal, a fistula of the second cleft must lie between the external and internal carotids; third cleft, common carotid and vagus; fourth cleft, bend around the subclavian on right side, arch of aorta on left side.

The last-named is very unlikely to arise, and indeed, it is only fistulæ of the second cleft that have hitherto been recognized with perfect certainty (Fig. 7).

BRANCHIOGENIC CYSTS

These cysts arising from the branchial system of clefts (see embryology) are of very common occurrence and give rise to considerable difficulty of diagnosis. Indeed, in many instances it is only after microscopic examination of their walls that their true nature is discovered. In the hospital 15 cases have been treated, the youngest occurring in a baby of 9 months, the oldest in a man of 70. The majority occurred between the ages of 20 and 40. Sex seems to have but little bearing, as in our cases 8 were male and 7 female. Clinically, they usually have a slow painless growth over which the skin moves freely. The rapidity of growth varies and occasionally variations in size have been noted, due probably to a sudden increase or decrease in contents. At other times they increase to a certain size, then remain stationary. A not uncommon complication which alters the general course is secondary infection of the contents of the cyst, as occurred in one of our cases, following acute tonsillitis. Occasionally they rupture externally, leaving a persistent sinus. The situation in which these tumors are most frequently met with is just below the angle of the jaw at the anterior border of sternomastoid. The duration of time before patients sought relief varied from a few months to thirteen years. Experience here in the

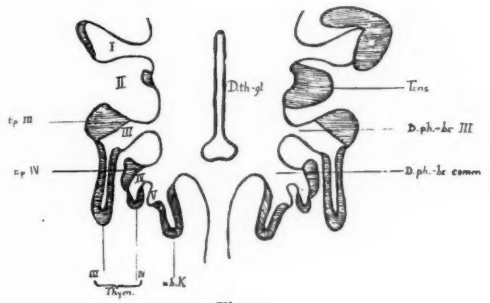


Fig. 5.

hospital and also a study of the literature reveals the fact that they have been most frequently diagnosed as tuberculous glands. Especially is this likely to occur when suppuration has taken place. The finding of a portion of cyst-wall or the contents of the cavity usually is sufficient to settle any doubt as to what its nature is. The prognosis is good, as these tumors usually readily shell out and do not recur. The one great danger is the possibility of malignant change which unfortunately is not so very infrequent (see branchiogenic carcinoma, Case 1).

Pathology. They usually possess a fairly thick fibrous tissue capsule lined inside by a variety of forms of epithelium. In the majority of cases the lining consists of a stratified layer of horny pavement epithelium, frequently showing papillary projections into the lumen,

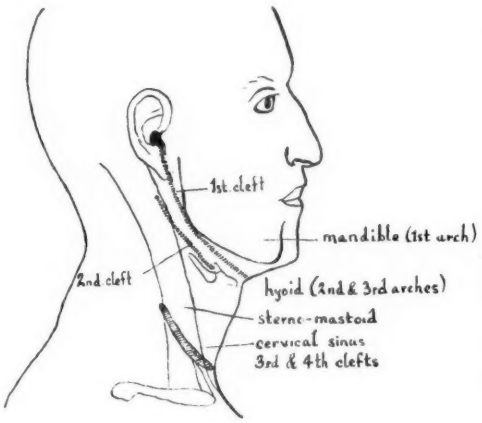


Fig. 7.

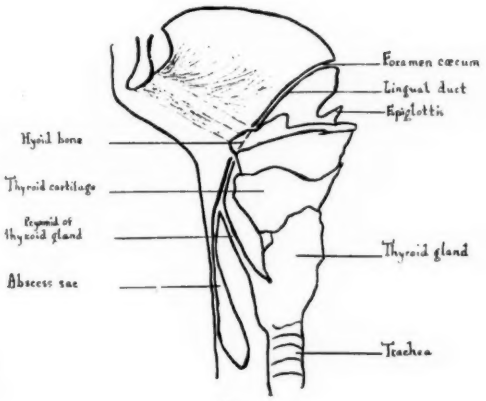


Fig. 6.

and here and there may be seen the so-called sweat or sebaceous glands. Again, the lining may be more of the columnar type, in which case the contents are of gray-starchy or mucous character. In the first case the contents usually consist of a fatty atheromatous material containing cholesterin crystals and absence of bacteria in non-infected cases. The wall often looks soft and œdematous with numerous blood-vessels and a great amount of lymphoid tissue with many germ centers.

Below are the descriptions of the fourteen cases previously mentioned:

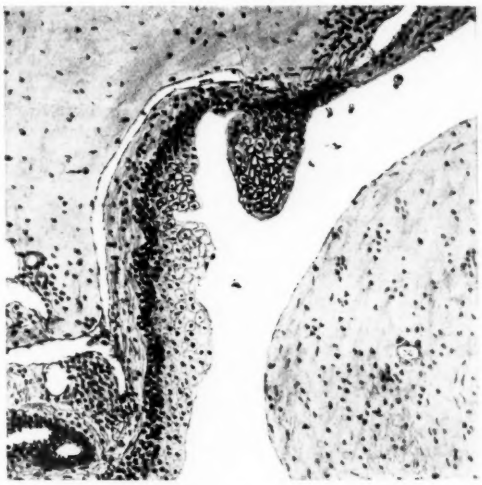


Fig. 8. Case 1. Branchiogenic cysts.

CASE 1. R. Culley, male, aged 23. Seat of disease: Right angle of lower jaw. Duration of symptoms before admission: One year. Chief features of illness: Freely movable, smooth, painless and tense. *Treatment:* Shelled out. Cyst lined by pavement epithelium and filled by sebaceous material. (Fig. 8, Case 1.)

CASE 2. C. Lefebre, female, aged 9 months. Seat of disease: Below front of right ear. Duration of symptoms before admission: Since birth. Chief features of illness: Discharging sinus with clear material. *Treatment:* Curetted. Structure lined by squamous epithelium.

CASE 3. F. Worrell, female, aged 24. Seat of disease: Left angle. Duration of symptoms before admission: Three months. Chief features of illness: Varied in size. *Treatment:* Shelled out.

CASE 4. G. Mitchell, male, aged 25. Seat of disease: Left angle. Duration of symptoms before admission: Two years. Chief features of illness: Seemed adherent to deeper structures. Skin freely movable over it. *Treatment:* Shelled out. Cheeselike material. Cultures sterile.

CASE 5. Jas. Wade, male, aged 28. Seat of disease: Left angle. Duration of symptoms before admission: Two years. Chief features of illness: Painless enlargement. *Treatment:* Shelled out. Cheesy material. Cyst-wall lined by squamous epithelium.

CASE 6. Mrs. L. Chalmers, female, aged 33. Seat of disease: Right angle. Duration of symptoms before admission: Three years. Chief features of illness: Painless enlargement. *Treatment:* Shelled out. Cheesy material with cholesterin crystals. No bacteria.

CASE 7. Mary Legget, female, aged 17 years. Duration of symptoms before admission: Four months. Chief features of illness: Painless enlargement. *Treatment:* Shelled out. Contained cheesy, odorless material. Lined by stratified epithelium.

CASE 8. L. Forget, male, aged 70. Duration of symptoms before admission: Two years. Chief features of illness: Small mass on right side above suprasternal notch; grew rapidly of late and burst. *Treatment:* Cyst dissected out. Lined by a stratified epithelium with several small papillary projections. Hairs growing out in one or two places.

CASE 9. H. M. Paquette, female, aged 46. Seat of disease: Left side of jaw. Duration of symptoms: Two years. Chief features of illness: Grew slowly, freely movable, painless. *Treatment:* Shelled out; contained cheesy material.

CASE 10. C. Kent, male, aged 41. Seat of disease: Left side jaw. Duration of symptoms before admission: Four years. Chief features of illness: Grew slowly at first, then more rapidly to size of orange. Freely movable. *Treatment:* Shelled out; contained grayish turbid fluid. Walls thick, with lymphoid tissue.

CASE 11. P. Turner, male, aged 32. Seat of disease: Right angle of jaw. Duration of symptoms: Three years. Chief features of illness: Grew slowly, freely movable. *Treatment:* Dissected out.

CASE 12. G. Andrews, male, aged 55. Seat of disease: Right side of neck above thyroid cartilage. Duration of symptoms before admission: Thirteen years. Chief features of illness: Grew gradually, freely movable. No glandular involvement. *Treatment:* Incision and shelled out. Brown watery fluid.

CASE 13. Emma Dense, female, aged 20. Seat of disease: Left jaw. Duration of symptoms before admission: Six years. Chief features of illness: Grew gradually. Varied in size. Bulged into mouth. Fills up submaxillary space. *Treatment:* Cyst shelled out. Contained grayish semisolid material. Wall thick. Blood-vessels numerous. Flattened epithelium.

CASE 14. M. F., female, aged 11. Seat of disease: Below angle of right jaw. Duration of symptoms before admission: Six years. Chief features of illness: Grew gradually to size of small nut, then broke, and since that time a fistula discharging a small amount of glairy material has persisted. A probe inserted along track of fistula passed inward and forward but apparently did not open directly into pharynx. Operation refused.

BRANCHIOGENIC CARCINOMA

This term is applied to tumors which arise from the epithelium of branchial clefts or secondarily to carcinomatous change in branchiogenic cysts. Our knowledge of these tumors was first furnished in 1882 by Richard von Volkmann[1] who had observed three cases of neck carcinoma in which there was no original growth in the skin or in the mucous membrane of the nose, mouth, pharynx, larynx, œsophagus, or ear, and which did not originate in lymph-glands. The records of the Royal Victoria Hospital show five undoubted and two doubtful cases, six occurring in males and one in a female. Age also seems to be of importance, the youngest person affected being 44 and the oldest 73; the remainder were between the ages of 53 and 65 (see cases). The right side was affected in three of the undoubted cases, the left in two. The one remarkable feature of the clinical history is the tremendous rapidity of growth in all our cases with the exception of Case 1, which is an example of secondary carcinomatous degeneration of a branchiogenic cyst. The tumor mass is usually situated behind and below the angle

[1] Das tiefe Branch Hals Karcinom. Zentralbl. f. chir., 1882, lx, 49.

of the jaw; it is hard and fixed, and the skin over it is movable. Pain, which in very early cases may be absent, is usually severe caused by the involvement of nerves in the region of the growth. It is not probable that an accurate diagnosis can be arrived at in many of these tumors before they are removed and histologically examined. The diagnosis must rest on this: that an epithelioma of the neck which does not involve the skin or mucous membrane and of which no original focus can be found in these structures is to be looked upon as a branchiogenic carcinoma, and it is well in our clinical examination of deep cervical tumors to bear in mind the possibility of the growth being of this type. The necessity of a thorough examination of the *mouth*, *pharynx*, and *larynx* cannot be emphasized too strongly as a growth not as large as a split pea will give rise to very extensive metastases. More than one experienced surgeon has learned for the first time at post-mortem the presence of a primary growth in the pyriform fossa, which had escaped his notice in the ordinary routine examination.

Prognosis. Is distinctly bad. In the Royal Victoria Hospital the mortality was 100 per cent. This is partly due to the situation, where so many important structures are early involved, and also to the extreme malignancy of the tumor. Case 3 died of cerebral metastases.

Pathology. The type of tissue presented by this group of carcinomata is usually quite characteristic in that the cell masses are very large and stroma tissue infinitesimal. The individual cells are themselves characteristic because they tend to be regularly polygonal, have very pale cell-bodies and rather small nuclei with punctate chromatin. The result is the formation, in a section, of a pavement-epithelium-like structure. The rapidity of growth is estimated by the abundance of mitoses of aberrant type. The case in point constitutes a borderline between this form and the indeterminate tumors designated as endotheliomator perithelioma. The perithelioma, as is well known, is made up of small rounded masses of cells that possess mainly a spindle or columnar form and are arranged in whorls of very striking appearance. The interacinous connective tissue is very abundant and tends to be arranged in laminæ around the parenchymal cells. Even here the constituent cells possess neoplastic traits, being of short spindle form with relatively large, pale, round nucleus. Between these two extremes we have a form in which acinous masses of some size are separated by considerable amounts of laminated fibrous tissue. The acinous masses are found to comprise two forms of cells, the first one having a decidedly epithelial form, being large, polygonal, with relatively small pale-staining nucleus and intermingled with peculiar round large bodies known as cancer bodies; in some cases these cell groups closely resemble the epithelial pearls of a cutaneous carcinoma. The second type is much smaller, arranged in stratified form, and tends to possess a columnar shape, although the stratifications give rise to an egg-shaped or spindle-shaped form in many instances. The nucleus stains very deeply and is relatively large. The cytoplasm is more acidophile than is the case with the first type. The central part of the acinus is especially characteristic because it consists entirely of necrosed cells, which form a granular red-staining mass lying free in a sort of cystic cavity whose walls are perfectly regular owing to the free edge of the stratified epithelium having an even contour. A few scattered nuclei are visible in this necrotic mass. Sometimes blood is present in large amounts. It will be seen that here we have a form of acinous carcinoma of impure type, some of the cells being of squamous aspect. On the other hand, the radial arrangement of the stratified cells is exactly that of endotheliomatous masses. The growing edge of such a tumor shows tongue-shaped sproutings which probably represent invasion of lymphatic clefts for some distance beyond the main tumor, although there is a possibility of the stroma cells themselves developing parenchymal characteristics.

Below is the description of the five cases previously mentioned:

CASE 1. Ross Mocintye, male, aged 73. Seat of disease: Right side below angle of jaw. Duration of symptoms before admission: One year. Chief

features of illness: One year ago small mass appeared below angle of jaw, anterior border of sternomastoid. Grew gradually, was at first movable, tapped on one or more occasions and only blood-stained serum removed. Afterwards skin and underlying tissues became adherent.

Pathology. Cyst contained cheesy material. Sections of tissue removed show fairly adult fibrous tissue covered on surface by stratified epithelium, which shows papillary-like projections into central space. There is also extensive infiltration of muscular and fibrous tissue with epithelial cells. An incision over mass disclosed a multilocular cyst at base of which a tumor was found which was adherent to deep vessels of neck. No attempts at removal.

CASE 2. F. Stephens, male, aged 53. Seat of disease: Right side, below angle of jaw. Duration of symptoms before admission: Seven weeks. Chief features of illness: Seven weeks ago noticed a small mass which grew rapidly and early pain developed in region of shoulder, up side of neck to head. Tumor large and firm, adherent to deep structures. Skin moves over it. Structure: Portions of tissue removed show typical alveolar structure consisting of cells of moderate size and fair amount of chromatin; stroma moderate in amount, showing in places small-cell infiltration. Tumor mass infiltrating muscles and vessels. No attempts at removal.

CASE 3. S. Krusella, female, aged 57. Seat of disease: Left side of neck. Duration of symptoms before admission: Twenty-five years. Chief features of illness: Twenty-five years ago tumor removed from neck; 1893, another small mass was removed from posterolateral aspect of oral cavity. Microscopic examination of this tissue showed epithelial overgrowth containing cell-nests. Origin uncertain. No recurrence of trouble for eleven years. Then a small tumor developed on left side of neck lying just behind angle of jaw, size of hen's-egg. Skin free over it. No evidence of fluctuation. Incision into mass: Tumor consists of epithelial or endothelial-like cells infiltrating a fibrous tissue stroma, consisting of young and old fibrous tissue. Some hyaline degeneration with moderate round-cell infiltration. No attempt at gland formation. Cells large, cubical, joined edge to edge. Much cytoplasm. Nuclei round and well-staining.

CASE 4. Martin Feron, male, aged 65. Seat of disease: Left angle of jaw. Duration of symptoms before admission: Four weeks. Chief features of illness: Small mass appeared four weeks ago which grew in one night nearly to size on admission. At first painless, but later pain has been severe, radiating up head and to shoulder. Tumor mass firm and size of tangerine. Skin free over it but tumor attached to deeper structure. *Treatment:* No operation. Examination of throat by Dr. Birkett revealed nothing. Two other cases, diagnosed branchial carcinoma, were probably secondary to previous mouth ulcer.

CASE 5. E. Louch, male, aged 41. Seat of disease: Right side. Duration: Three months. Chief features of illness: Three months previous, below and behind angle of jaw on right side of neck, painless, firm mass size of hazel-nut noted. Shortly afterward small growth appeared under lobule of right ear. Masses remained stationary for a short time, then began to grow suddenly and stabbing pain noticed which became worse as growth increased. Shoulder muscles became weak, and pain radiated down shoulder. Slight loss of weight. History of syphilis. Mass now size of large hen's-egg, hard, fixed 4 x 2½. No glandular involvement on opposite side or at a distance. *Treatment:* Tumor easily shelled out below, but above infiltrated jugular vein. This was also removed. Died January 11, 1912.

Macroscopic appearance. The specimen consists of a tumor of the neck which has infiltrated the muscles in the vicinity. The growth is firm, has a grayish white appearance with yellow spots here and there. There are numerous lymphatic glands amongst it which are invaded.

Microscopic appearance. Sections show large bands of connective tissue which are very œdematous. Lying in these bands are masses of cells. These cells vary in appearance, for the most part, are low, columnar, and often spindle-shaped; again, they are often more endothelial in type and in several areas look like squamous cells, but no prickles have been noted. The general arrangement of masses of cells is that of an endothelioma arranged in relation to blood-vessels. The central part of the mass of cells is often degenerated. Other sections of same tumor taken from different parts resemble very much spheroidal-celled carcinoma. Blood-vessels are numerous and possess fairly well-developed walls.

THYROGLOSSAL CYSTS

Cysts arising in obliterated thyroglossal ducts, the old connecting link between foramen cæcum of tongue and isthmus of thyroid (see embryology).

Frequency. We have collected from our records only nine cases, seven occurring in male and two female, the youngest five years and the oldest 56 years.

They are situated in the middle line, usually in relation to the hyoid bone or to the upper border of the thyroid. They grow slowly, but show variations in rapidity of growth.

The tumor appears as a painless cystic swelling which may break through the skin, forming a median fistula discharging a mucus-like material.

Prognosis. Is fair, but recurrence is not uncommon owing to the failure of the surgeon

to follow it through or behind the hyoid bone.

Diagnosis. This is not very difficult, but such cysts must be distinguished from (1) the ordinary sequestration dermoid found in the middle line in any part of the body but especially frequent in occurrence in this particular locality; (2) ordinary sebaceous cysts, but the facts that these latter are entirely in the skin and do not occur before puberty are usually sufficient to separate them from the true thyroglossal cyst.

Pathology. The cyst wall consists of fibrous tissue, in the region of which one often notes atrophied thyroid tissue (see case diagram). The lining is usually of columnar type but frequently flattened from pressure, or in cases where suppuration has occurred the epithelial lining may be wanting. Contents, usually mucus or starchy, gray material.

Below is a description of ten cases previously mentioned.

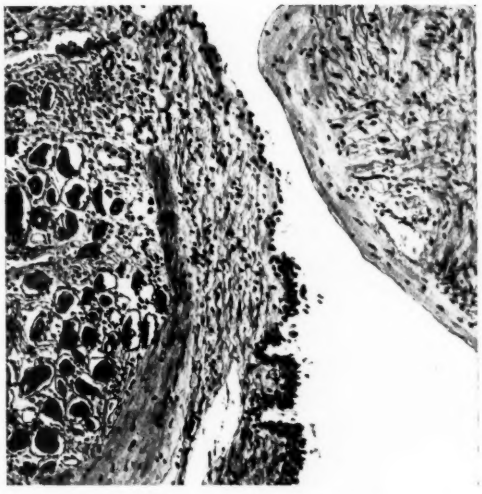


Fig. 9. Case 10. 1505.13. Thyroglossal cyst from neck. Low power.

CASE 1. R. Marson, male, aged 56. Seat of disease: Middle line over thyroid cartilage. Duration of symptoms before admission: Six months. Chief features of illness: Gradual painless enlargement. He injured this while walking, which ulcerated it. A small sinus resulted, which, on swallowing afforded a discharge of bloody material *Treatment:* A cyst was found, which extended down the hyoid bone. Excised.

CASE 2. I. Perrault, male, aged 30. Seat of disease: Middle line of neck just below hyoid bone. Duration of symptoms before admission: Present since childhood. Chief features of illness: Remained stationary for some time, then gradually increased in size. No discomfort. Skin freely movable over it; it seemed attached to deeper structures.

CASE 3. H. Patterson, female, aged 26. Seat of disease: Midline below hyoid bone. Duration of symptoms before admission: Three months. Chief features of illness: Gradually increased in size, freely movable, and moved with swallowing. *Pathology:* Cyst contained slightly turbid fluid.

CASE 4. G. Saad, male, aged 22. Seat of disease: Middle line. Duration of symptoms before admission: One year. Chief features of illness: Mass lanced, discharged yellowish thin fluid. Sinus remained. Tissue about sinus showed marked inflammatory infiltration. *Treatment:* Resected. *Pathology:* Sinus extended down to hyoid bone; sections showed a tube lined by columnar epithelium.

CASE 5. E. Biard, male, aged 9. Seat of disease: Middle line near hyoid bone. Duration of symptoms before admission: First noticed six months ago. Chief features of illness: When mass was first noted it was size of a marble; gradual increase in size. Skin over it not adherent. No subjective symptoms. *Pathology:* Sac contained a yellowish gelatinous material. *Treatment:* Dissected out.

CASE 6. DeGarneau, male, aged 5 years. Seat of disease: Middle line over thyroid cartilage. Duration of symptoms before admission: Two years. Chief features of illness: Gradual increase in size, and as it grew divided into two halves, the raphe placed centrally, cyst growing laterally. Moved with deglutition. Skin over it freely movable. *Pathology:* Sac contained yellowish, thick, creamy material. Cubical or low columnar in several layers. Extended through hyoid bone.

CASE 7. M. Oughtred, male, aged 11 years. Seat of disease: Midline near hyoid bone. Duration of symptoms before admission: Since two and one-half years old. Chief features of illness: Mass developed after attack of tonsillitis; was lanced, discharging quantity of fluid; curetted several times. Sinus persisted. *Treatment:* Wall of sinus was dissected away. *Pathology:* Section shows masses of fibrous tissue and evidence of chronic inflammatory processes. In this mass three ducts were found lined by columnar epithelium, one of which was elongated narrow.

CASE 8. H. Christie, male, aged 12 years. Seat of disease: Middle line over thyroid cartilage. Duration of symptoms before admission: Six years. Chief features of illness: When first noted, very small. Gradually increased in size for period of year and then was removed. Small sinus remained

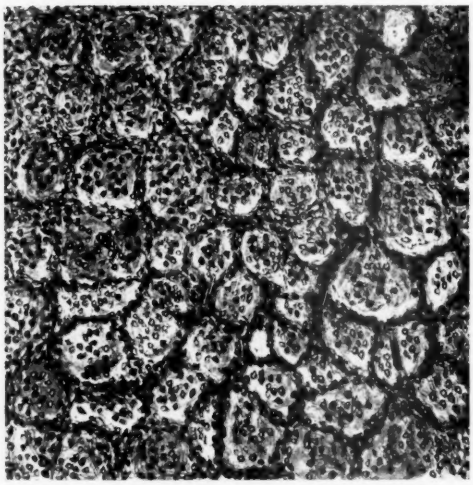


Fig. 10. Glandula carotica. Low power. Carotid body.

which one year later was dissected out and found to go down to hyoid bone. Patient quite well until one year ago when it again began discharging; again dissected out down to hyoid bone. *Treatment:* Dissected out. *Pathology:* Sections show fibrous tissue with dilated vessels and round-celled infiltration.

CASE 9. Chesley Wood, male, aged 47. Seat of disease: Just above isthmus of thyroid. Duration of symptoms before admission, one year: Chief features of illness: Small cystic mass adherent to thyroid cartilage with skin freely movable over it. *Pathology:* Sections show fibrous tissue wall lined by endothelium. No epithelium.

CASE 10. R. Dorgnault, male, aged 47. Seat of disease: Just above isthmus of thyroid. Duration of symptoms before admission, one year. Chief features of illness: Small elastic growth increased to size of a nut, then remained stationary. *Pathology:* Walls consisting of œdematous fibrous tissue with thyroid tissue in wall. No evidence of epithelial lining, excepting in one small area where it was of a low columnar type. (Fig. 9, Case 10.)

CAROTID BODY

The carotid body or glandula carotica (Luschka), ganglion intercaroticum (Andersh), is a very interesting structure situated at the bifurcation of the common carotid, with which it is intimately connected, being attached to one of the vessels between which it lies by a connective-tissue stalk (ligament of Mayer), through which it receives its blood supply. It varies in size and shape, gradually increasing in size until the individual reaches maturity after which time it remains stationary. The bodies may be absent on one or both sides. They have a firm elastic feel and the color varies from a reddish gray to a reddish brown. The body is surrounded by a dense fibrous (white and elastic) connective-tissue capsule from which prolongations are sent in dividing the gland into lobes and lobules. These delicate fibrils passing in surround masses of the characteristic cells, giving the whole structure an alveolar arrangement. The individual cells are large, rounded or polyhedral in shape, containing a large amount of clear protoplasm with a large, round, well-staining nucleus. The nerve supply is abundant and is connected with both the cranial and sympathetic system.

Embryology. This body has been repeatedly included in the series of branchiogic structures derived from the third pouch. It is, however, a derivative of the chromaffine system, a paraganglion, in man and other animals, therefore, probably in mammalia in general. Paltauf thought that it had its origin in a circumscribed thickening in the wall of the internal carotid. A. Kohn derives the chromaffine elements of the glandula carotica from the nerve anlage which passes from the upper cervical sympathetic ganglion between the two carotids. In a 44 mm. pig embryo, he finds in this plexus ganglion cells, some of which have a large and feebly-staining nucleus, and believes that these latter present the specific elements of the carotid gland.

Physiology. Stilling demonstrated chromaffine cells in the substance of the gland, and various experiments have been carried out along the line of investigation of chromaffine substances found elsewhere in the body. P. Mulon [1] prepared a watery extract of the carotid bodies of a horse and injected it into the vein of a rabbit, producing a rise in blood-pressure; while Gomez [2] with a glycerine extract produced a fall of blood-pressure in cats. Various experiments by different investigators have yielded such varying results that at the present time nothing very definite can be said.

Clinical history. A review of the literature reveals the fact that tumors are most frequently met with between the ages of thirty and fifty; in other words, after the carotid body has reached its full period of development. The youngest case reported is eighteen, the oldest seventy. The sexes appear to be

[1] Arch. gen. des medecin.. 1904.
[2] Am. J. M. Sc., 1908.

equally affected. The tumors usually afford a long history of slow growth and during this period may manifest the characteristics of a benign neoplasm. They are encapsuled, do not invade surrounding tissues, and give rise to no symptoms other than deformity. Later on they may take on rapid growth and assume the characteristics of a mildly malignant tumor, recurrences and metastases being reported. In this respect these resemble very much the so-called endothelioma.

Prognosis. Owing to the tumor's intimate connection with the carotids, its removal is attended with considerable mortality, even in benign cases, because, as Kaufmann and Ruppener[1] pointed out, the ligature of external or internal carotid is so frequently necessary for its complete removal. If it has assumed a more malignant aspect, as is evidenced by its increased rapidity of growth and infiltration of surrounding structures, the condition is hopeless and no attempt should be made to remove it.

CAROTID BODY TUMOR

There is only one case recorded in Royal Victoria Hospital of this very uncommon form of tumor which occurred in the following patient:

Mrs. J. M., age 60, married. Six years ago for first time noted a small mass size of pea immediately in front and below the angle of the jaw. In one year it grew to size of a walnut. The growth was slow, progressive, and painless. On entrance to hospital the tumor was the size of a tangerine, firm, smooth, with an elastic feel. The skin over it was freely movable. No glandular involvement.

Blood examination. Erythrocytes, 3,290,000; leucocytes, 6,400, hæmoglobin, 75 per cent. No eosinophiles. General health good. Sought relief for cosmetic purposes.

Operation. Tumor evidently lying at the bifurcation of common carotid. It was free on all sides, except at bifurcation, where it could not be separated; the external carotid in particular seemed to be invaded for a short distance from its origin. External carotid ligatured and tumor removed. Patient developed hæmiplegia and died in a few days after operation.

Macroscopical. Tumor size of hen's egg, fairly firm, dark, reddish pink in color. On cutting across it a more or less alveolar appearance.

[1] Deutsch. Ztschr. f. Chir., 1905.

Microscopical. Tumor consists in growing parts of branching capillaries which are often dilated and filled with blood. With the low power it has an alveolar arrangement. This forms an intricate network, in the meshes of which are seen the characteristic cells. The capillaries have often fairly thick walls. The cells are packed in these meshes and attached to the capillary wall, with often a radiate arrangement giving the picture as seen in perithelioma, (indeed, Borst classifies these tumors as such). The cells are large, oval, and polymorphic, containing a quantity of clear protoplasm. Nucleus large, vesicular, with one or more eccentric nucleoli. Occasionally in the center of cell masses there is necrosis, giving rise to a central lumen. The tumor apparently grows by increase of capillaries forming a network which becomes filled with the characteristic cells. Paltauf and Marchand have already noted the similarity of this arrangement of normal carotid gland to tumor derived from it. New-growth in this body causes no increase in its internal secretion, as it does in thyroid or adrenal. (Fig. 10.)

CONCLUSIONS

1. The branchial system of arches and pouches is a frequent source of cysts, fistulæ, and new-growths occurring in the neck.

2. The diagnosis of such conditions, particularly branchial carcinoma or the laterally placed dermoid cysts, is very difficult.

3. A thorough examination of the mouth and throat is an absolute necessity in all forms of neck tumors.

4. Carotid body tumors are infrequent, are usually mistaken for accessory thyroids, and are rarely diagnosed before operation.

5. The study of these various tumors has led us also to consider the tumors found in the parotid region, which have been classified in various ways by different authorities; we have, in fact, a paper in preparation on these tumors. It may not be amiss in this particular paper to say that in our opinion these tumors should be called first or second arch tumors rather than parotid tumors, because in them we find present all tissues which take part in the formation of the arch (cartilage, etc.). From the many and complicated changes going on in this region, it is not difficult to assume that a snaring off of embryonic portions of these arch structures could easily account for the "mixed tumors" found in this situation.

A CASE OF COMMON ILEOCOLIC MESENTERY WITH TORSION [1]

By CAI TAGE-HANSEN M. D., Copenhagen, Denmark.
From the Pathological Institute at the Communal Hospital of Copenhagen (Chief: Lauritz Melchior, M. D.)

THE case referred may probably deserve publication on account of its surgical and anatomical interest.

Fifth Department of the Communal Hospital (Chief: P. N. Hansen, M. D.), Journal No. 1669, 1913.

Female, age 15; admitted October 22, 1913; died October 23, 1913. No tuberculous disposition; has never been scrofulous. The patient has always been lean and meager.

Bowels have always been natural, but periodically once or twice a year the patient has had similar symptoms as now; viz., sudden pains in the abdomen, constipation for a few days, and greenish vomiting. Periods appeared for the first time last autumn; have always been regular. Has never had symptoms from the chest.

Was suddenly taken ill eight days ago with violent pains in the abdomen, principally in the epigastrium, and greenish vomiting. The patient had a movement the day she was taken ill; scanty, hard stools at home five days later; none since. Can give no information as to flatus. The patient's sensory not quite clear. She has not been able to eat at all, nor has she slept during this time, having failed considerably. Micturition in order. She is tall, slim, and very meager. Turgor of the skin is greatly reduced. The tongue is partly dry, not coated, lips parched. The cheeks are slightly flushed. Thorax is very narrow. No stethoscopical changes of lungs or heart to be detected.

The abdomen is narrow and meager, sunken, with projecting iliac crests, soft, somewhat tender in the right side of the epigastrium under the curvature without rigidity, no tenderness on McBurney's spot. By palpation, ventricle-splash is found the width of a few fingers lower than the umbilicus. Temperature 102°, pulse 140.

October 23d. Immediately after admittance the patient was given two pints of saline hypodermatically, and, on account of great restlessness, hydrochloride of morphia (5 minims); later, every other hour, camphor oil and caffeina (hypodermatically). Broke down rather suddenly and died about eight hours after admittance.

Autopsy, October 24, 1913 (30 hours post-mortem). The body is a good deal above middle height, lean, and very meager. Face sunken; neck long and thin; thorax extremely long with acute epigastric angle; abdomen not distended.

The left lung adherent in upper part; no certain signs of tuberculosis. The organs very anæmic. There is no fluid in the peritoneal cavity. By inspection of the opened abdomen, nothing is seen of the small intestines, as the whole space is filled up by the stomach, the duodenum, and the cæcum. The stomach is exceedingly distended. The greater curvature lies somewhat lower than the umbilicus. It continues in the enormously distended duodenum. There is a twist of the axis of the mesentery common to the small and large intestines, so that the part of the intestines which lies between the inferior part of the duodenum and the right half of the transverse colon (both included) takes part in the twist, which amounts to $2\frac{1}{2} \times 360°$. The direction of the twisting is the same as the movements of the hands of a clock (i. e., a screw with a left-hand thread). The transverse colon runs dorsally to the duodenum and the stomach. The right part of it is not provided with omentum, whereas a veil-like omentum extends from the sunken greater curvature upwards and backwards to the left part of the transverse colon. The sigmoid flexure is very long; it lies all the way over on the right side behind the twist.

Corresponding to the torsion, fibrinous adhesions are found between the duodenum and the ascending plus the transverse colon; upwards, towards the first twist, the adhesions become stronger and of more fibrous character.

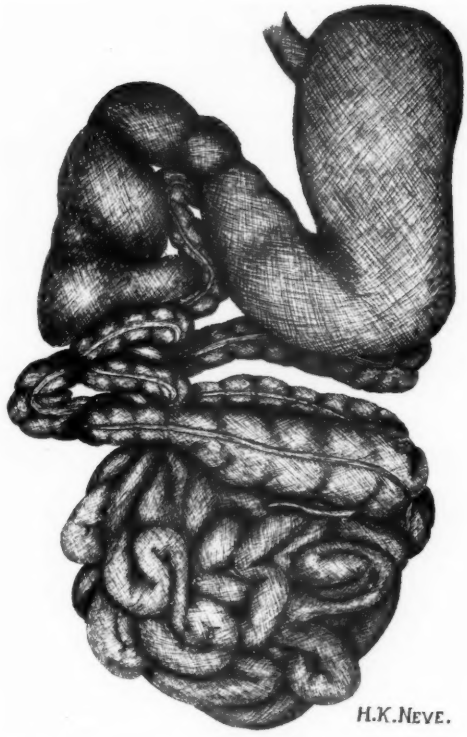
When now to obtain detorsion, a torsion is performed in a screw with a right-hand thread of $2\frac{1}{2} \times 360°$, the detorsion so far succeeds, as the duodenum now runs a straight course, and both upwards and downwards the duodenum lies most ventrally; behind this the mesentery with the superior mesenteric vessels are situated, and hindmost the large intestines. But the relations on the middle part of the straightened screw are furthermore complicated, as a part of the ascending colon has risen ventrally in front of the duodenum, having performed a twist of more than 180° in a screw with a right-hand thread. The said part of the large intestines is by firm fibrous adhesions fixed to the right side of the duodenum and its mesenterial attachment. In this region the duodenum thus runs through a tunnel formed by the mesentery and the large intestine, and it emerges from this tunnel in such a manner that the normal conditions of the duodenojejunal flexure are brought to mind. The straightened screw is about 14 cm. long.

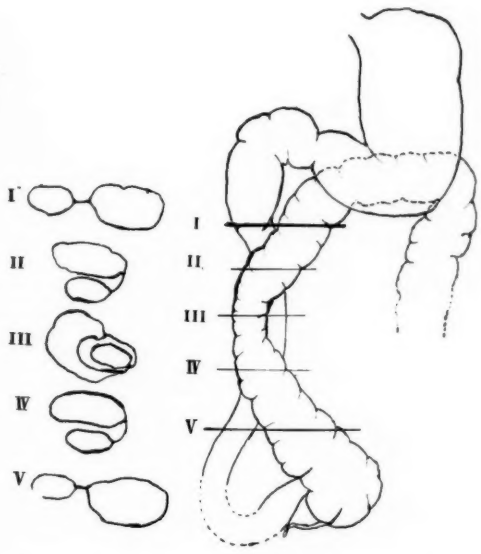
Numerous fibrous streaks are found in the mesocolon corresponding to the lienal flexure, the descending colon, and the sigmoid flexure. Similar streaks, but fewer in number, are found in the mesentery.

The specimen is kept in the pathological anatomical institute at the University of Copenhagen.

The conditions under which such a torsion may take place are: There is a common ileo-

[1] Demonstrated at the Pathological Society of Copenhagen, December 11, 1913, and at the Danish Surgical Society, March 14, 1914.





colic mesentery, and the development of the mesentery has stopped at a very early period of the embryo. According to His and Toldt, as early as the fifth or sixth week the physiological twisting of the intestinal canal begins. That part which is the territory of the mesenteric artery is the latter inferior part of the duodenum, jejunum, ileum, cæcum, ascending colon, and about half of the transverse colon,— just the part which in the above mentioned case has been drawn into the torsion. While the natural development takes place in such a way that the loop is twisted into a screw with a right-hand thread, the twist in this case has taken place in the contrary direction, producing a screw with a left-hand thread. By this, the duodenum lies ventrally to the colon. The superior mesenteric artery, which is to lie in the mesentery between these two parts of the intestines, must run dorsally to the duodenum.

According to Wilms, twistings, in most cases of ileocolic mesentery, take place with torsions in this direction; out of 50 cases collected by Faltin, 35 were twisted in a screw with a left-hand, 15 in a screw with a right-hand, thread. Instead of the expressions prevailing in literature,— "with or contrary to the sun," "with or contrary to the movements of the hands of a clock,"— one ought, as emphasized by Faltin and von Thun, to use the expressions, "screw with a left- or a right-hand thread," which prevents misunderstanding.

It is very rare that the torsion reaches such extreme degrees as in the case described here. Kuljabko Korezki (quoted after Zoege von Manteuffel) in 1897 published a case in a Russian paper in which there were four twistings of a large part of ileum plus the cæcum plus the ascending colon; but this case is quite isolated, and Wilms says, referring to it, that a twist of only $2 \times 360°$ would be something quite unusual, four entire twists unimaginable. Excepting this case, I have in my investigation of the literature not succeeded in finding any twists larger than $2 \times 360°$. The statements of the degrees of the twists are, however, often vague. In the case I am referring to, we have considered the position of the vitelline loop (before any twist

whatever — physiologically or abnormally — has set in) as a starting-point for the measuring, and have thence calculated the torsion in degrees.

The peculiar position in this case of the ascending colon, which was noticed after the part of the intestines involved in the torsion was twisted $2\frac{1}{2} \times 360°$ backwards, was undoubtedly of much earlier date than the first-mentioned twist. What favors this opinion is that the adhesions here were much firmer, and that the upper part of the duodenum, and the stomach and cæcum as well, were so much distended. Supposing that the twisted intestines are twisted further 270° (i. e., imitating the physiological twisting), a picture is produced providing a most striking likeness to the norm: the cæcum lies in the right iliac fossa, the ascending colon runs upwards and to the left ventrally to the duodenum. The fact that the transverse colon runs behind (i. e., dorsally to) the stomach, is due to the enormous distention of the stomach, which must sink ventrally to the colon, as this is flexed to the posterior wall of the peritoneum by the lienal flexure. But the resemblance to the normal relations is only superficial; at the crossing-point every fixation of the intestines to the posterior wall of the peritoneum is omitted. Yet it is possible that we are dealing with a fœtal anomaly, that the vitelline loop actually performed the physiological twisting and formed a plica duodenojejunalis, but the evolution was stopped at this point and the fixation to the posterior wall of the peritoneum was omitted. The fact that the duodenum emerges behind the ascending colon (or perhaps the beginning of the transverse colon), instead of behind the middle of the transverse colon, is not without analogies; Zuckerkandl has seen the duodenum pass through the mesocolon in immediate proximity to the cæcum.

In opposition to this hypothesis stands another: that the referred position is of intravital origin as a sequel of the formation of adhesions by the previous attacks, which undoubtedly were volvulus attacks. The problem is the same as by the congenital retroposition of the colon, inasmuch as that word has been used for intravital torsions by persistent fœtal types of the mesentery. An actual retroposition coli of congenital origin has been found with absolute certainty only in four cases (Tscherning, Leopold Meyer, Strehl, Rovsing), though it may be most probable that the phenomenon has been overlooked in other cases.

A great deal of work has been done in drawing schedules about the abnormalities in the development of the mesentery, and about the different types of volvulus (Zoege von Manteuffal, Ekehorn, de Quervain). The attempts at grouping such findings have led to the drawing up of complicated schedules. It is of the utmost importance to know the formation of the intestinal tract, as it is the only way in which it is possible to understand the origin of these cases, which must be reckoned under suppressed growths. The physiological twisting of the vitelline loop may be omitted totally or may take place in an abnormal direction or degree. The fixation of the mesentery of the duodenum and the colon to peritoneum parietale respectively to omentum majus may be incomplete, as seen in the case referred; very seldom gaps are found in the mesocolon, through which the coils may pass (Ekehorn). It is most interesting that we observe in the anatomy of animals mesenterial types congruous to the human fœtal types (Kraft).

Clinically, the pictures produced by the anomalies of the mesentery are, of course, very different. A common ileocolic mesentery with omittance of or defects in the physiological twist may by chance be found at a post-mortem examination (Tscherning, von Thun), whereas the torsions as a rule will produce severe symptoms. According to the localization of the torsion and the degree of the occlusion, we will have symptoms of ileus of a higher or a lower type, complete or incomplete. Generally the patient is taken suddenly ill with severe pains in the abdomen, vomiting, and prostration; in many cases the symptoms appear in connection with violent exercise. Sometimes there is a difference in the intensity of the pains, as the patient lies on the one or on the other side. Occasionally circumscript meteorism can be seen. Contrary to this acute onset is the course, which

as a rule is prolonged; a duration of eight to ten days is by no means rare.

Just as it frequently is possible to ascertain that the patient formerly has had similar attacks, which have passed away without operative treatment, so remissions during the single attacks may frequently be observed, remissions during which the patient's general state of health is better, flatus is passed, and the local meteorism disappears (Boyd. Martin-Reid). In other cases the course is rapid, and death occurs within twenty-four to forty-eight hours. In such cases a larger segment of the intestines, by the post-mortem, has been found involved in the torsion, and both the intestines and the peritoneum have contained plenty of blood (Blecher, Burgess) — so much so that the bleeding has been considered the cause of death. Kraft looks upon the thrombosis of the mesenteric vessels as the main cause of death, while others lay greater stress on the paralysis of the sympathicus or on the intoxication from the stagnated contents of the stomach and the intestines (Wilms). The question is difficult to decide, but it is natural to suppose that the stated facts appear in mutual strength. The diagnosis is difficult,— in most cases all but impossible to make except as a surmise. In some cases a local meteorism may perhaps give a clue. The quantities of fluid that can be injected into the rectum may give a hint as to the localization of the volvulus. The prognosis is generally bad; as a rule, it is at a very late stage that the patients are brought under treatment, as they and their medical attendants are deceived by the frequently occurring remissions, and experiences from former attacks may tend toward the same. Partly in consequence of this, partly, too, because the operation in these cases often is difficult, the prognosis must be bad. A case like the one in question, even had it come under treatment much earlier, would have presented very great difficulties as to orientation.

The ideal treatment is detorsion, but it must be combined with a prevention of recurrence. The latter is prevented by fixation of the intestines to the wall of the abdominal cavity (Braun) or by plastic operation on the mesenterium (Senn). In many cases, however, it is impossible to untwist, partly on account of firm adhesions, partly on account of distention of the intestines; therefore it is often necessary to begin by an evacuation of the contents of the intestines (Moynihan, Rovsing). If the detorsion is not successful after this operation, there is the choice between primary or secondary resection, anastomosis operations (short-circuiting or an evasion of the screw by an anastomosis on either side of it), or the making of an anus preternaturalis.

In some cases it has been considered more advantageous to operate in several sittings; for instance, to begin by evacuating the stagnated contents of the intestines, and then, some hours later, to try a detorsion (Wilms). But so many conditions are to be taken into consideration that it is hardly possible to draw up concise lines for surgical intervention.

LITERATURE

Blecher. Deutsche Ztschr. f. Chir., lxiv.
Boyd. Lancet, Lond., 1897, ii.
Burgess. Ibid., 1092, ii.
Ekehorn. Arch. f. klin. Chir., lxxii and lxxvi.
Faltin. Nord. med. ark., 1903 (German).
Hausmann. Zentralbl. f. Chir., 1900.
Korezki. Quoted by Zoege von Manteuffel.
Kraft. Nord. med. ark., 1900 (Danish) & Hosp. Tid., 1905 (Dan.).
Martin-Reid. Lancet, Lond., 1899, ii.
Leopold Meyer. Bibliot. f. Læger, 1899 (Danish).
Moynihan. Abdominal Operations, 1906.
De Quervain. Semaine méd., 1901.
Rovsing. Hosp. Tid., 1913 (Danish).
Strehl. Arch. f. klin. Chir., lxxxvii.
Sundberg. Upsala Läkaref. Förh., 1897, ii (Swedish).
Von Thun. Bibliot. f. Læger, 1913 (Danish).
Tscherning. Nord. med. ark., 1883 (Danish).
Wilms. Arch. f. klin. Chir., lxix, and Deutsche Chir. Lieferung, 46 g.
Zoege von Manteuffel. Samml. klin. Vortr., N. F. No. 260.
Zuckerkandl. Quoted by de Quervain.

TUBERCULOSIS OF THE KIDNEY; WITH ESPECIAL REFERENCE TO ITS DIAGNOSIS

By GLEN EDRIE MACKLEM, A. B., M. D., Detroit, Michigan

THOUGH it may be said by many that the literature upon the above subject is already voluminous, nevertheless, to my mind, it constitutes a fertile field for thought and study, inasmuch as the value of the means for positive diagnosis is just beginning to be fully appreciated and understood. The past history of this disorder bears eloquent testimonial of the evils of the faulty and inexact means of diagnosis which were at the disposal of the conscientious physician, and the urgent need for the present-day helps which we have in our possession, in the form of an advanced knowledge in regard to abdominal diagnosis, the cystoscope, the microscope, and the estimation of renal activity, which is demonstrated by the phenolsulphonephthalein and indigo-blue tests. The early and positive diagnosis of the condition is of paramount importance from the standpoint of both patient and physician; the patient being spared hopeless extensive infection, with its attendant suffering and mental anguish; and the physician often gaining considerable renown for his alertness and skill. During the past few years the realization of the dangers of delayed recognition of this exceedingly important urologic condition has resulted in a well defined tendency to seek new agencies of greater refinement and exactness; and accordingly ideas and instruments of precision have undergone extensive revolutionary changes.

In view of the fact that the means of diagnosis which we have at our disposal at the present time are of fairly recent development, a brief résumé of their principal points of interest might not be amiss, considering the fact that but a small percentage of the profession understand their application. The use and technique of the microscope is, or should be, known even to the physician of the smallest hamlet, so that a description of this instrument might be considered superfluous.

The history of the cystoscope dates from 1805, when Bozzini of Frankfort conceived the idea of illuminating the urethra and bladder as a means of diagnosis. Naturally, this original instrument was of crude construction, and possessed disadvantages which were to be overcome only by further investigation and experimentation. The efforts of Bozzini were, however, not without results, for the interest of other investigators in this line was aroused, and a decided stimulus to their energies was received. Fürstenheim, Creuse, and Brück followed, each with instruments more refined in character, but it remained for Nitze and Leiter, combined with the advent of the incandescent lamp of Edison, to produce an instrument of somewhat practical value. As it is to-day, cystoscopy is an essentially practical procedure which the investigators of the past quarter of a century have developed, and it is evident that the McCarthy modification of the Brown-Buerger cystoscope will very materially influence the finer points of diagnostic importance. Not only is this instrument admirably designed for revealing the character of the interior of the bladder, but it also constitutes the finest example of an instrument for posterior urethroscopy now on the market. Although admirably suited for general work, it nevertheless is an instrument which can only be fully appreciated by men of superior technique, with an accurate knowledge of the regional anatomy such as is possessed by its designer. For ordinary work, however, it is doubtful whether any other instrument possesses as many useful and practical qualities as the plain examining cystoscope of Nitze, with the Zeiss system of lenses and corrected image. As to size, the No. 15 F is to be recommended, as it may be used with equal satisfaction in either the young nullipara or in the case of the largest urethra.

Although it must always be borne in mind that the object of cystoscopy is to examine the

bladder, and that it is not done for the purpose of catheterizing the ureters, unless clinical and urinary evidence point to ureteral or renal involvement, the condition under consideration presents a typical indication for ureteral catheterization unless a vesical tuberculosis exists, which is held by many authorities as always associated with and secondary to a renal infection. In this case, the tuberculous lesions about the mouth of the corresponding ureter are usually so suspicious that a further search is often uncalled for; and men of no small moment do nephrectomies in such cases even in the absence of all other symptoms, and after repeated failures to find bacilli in the urine.

Ureteral catherization in these cases often presents difficulties, in the presence of a turbid fluid medium, or an inability to clearly locate the ureteral orifices, due to the difficulty experienced in sufficiently distending the bladder, on account of a coexisting tuberculous cystitis; yet if the normal location of the ureteral orificies be continually kept in mind, by comparing the floor of the bladder to the dial of a clock, and thinking of the opening of the right ureter as corresponding to seven o'clock, and the left to five o'clock, much will have been accomplished.

It is a matter of prime importance that the testing of catheters be always carried out before using them, and that they be washed out immediately afterward, as the embarrassment of finding them plugged, and the necessity of their withdrawal for cleaning after they have been introduced, may thus be saved. Ureteral secretion is never normally continuous, but is always interrupted periodically, appearing in dribbles consisting of ten or twelve drops. It may thus be seen that should a kidney, after being catheterized, suddenly secrete a large amount of turbid white urine, while the other displays a secretion normal in amount, there exists a renal retention on that side, and one may infer that there exists a pyonephrosis, associated with a renal destruction of considerable extent. The rapidity of the urinary flow from each ureter should also be noted, yet the extent of the renal involvement cannot always be estimated by this means alone, as several cases are recorded in which the diseased organ secreted as much as four times the amount secreted by the healthy one, and yet had been almost totally destroyed. It will be found, however, that the specific gravity of the urine in the cases is very low. Occasionally cases are encountered where thick pus finds its way through the lumen of the catheter, and deposits itself in the test tube in a semisolid mass. This is always indicative of a non-functionating kidney, the presence of an organ which has been converted into a fibrous pus-sac, or to the existence of a perinephritic abcess.

As the technique of the introduction of the cystoscope and its use are so fully and vividly described in the treatise on cystoscopy of either Squier or Pilcher, the reader is referred to these excellent scources for his information on these points.

In the condition under consideration, the point of utmost importance demanding the attention of the diagnostician is the ability to determine the activity of both organs, especially that of the unaffected one, as much depends upon the findings as to the method of treatment to be undertaken by him; it is folly to perform a nephrectomy unless there is present in the kidney to remain, an amount of normal renal tissue corresponding to at least one-third of the total renal tissue when in good health. It is here, then, that the functional renal tests are called into play. Much could be said in regard to the efforts of the early investigators to satisfactorily solve the question as to the best means to be adopted to determine to just what degree the renal cells were carrying on their work, in comparison to the normal; but it remained for Rowntree and Geraghty, of Johns Hopkins Medical School, to simplify the procedure by the introduction of phenolsulphonephthalein as the coloring agent, and for Hellige to introduce his colorimeter for the accurate estimation of the degree of excretion. The test, though easy to perform, is nevertheless but little known to the profession as a whole; consequently a few words as to its application, and the method of estimating the quantity excreted by the use of the colorimeter, might be of value to some.

The patient's bladder should be completely emptied, and exactly 1 ccm. of the phenolsulphonephthalein solution from an ampoule injected into the lumbar muscles. At the end of an hour, from the time the urine rendered alkaline first shows coloration, the entire contents of the bladder should be collected and the amount of phenolsulphonephthalein excreted, accurately estimated. This is accomplished by first filling the wedge-shaped cell with a standard solution, made by diluting exactly 1 ccm. of phenolsulphonephthalein solution, from an ampoule, with about 200 ccm. of water, adding 10 ccm. of a five per cent solution of sodium hydroxide, or its equivalent, and sufficient water to measure one liter. Place the filled cell in the colorimeter. Dilute the specimen of urine to about 200 ccm. with water and render alkaline by adding 10 ccm. of a five per cent solution of sodium hydroxide, then further dilute the alkaline urine with sufficient water to make it measure one liter. Enough of this solution should be perfectly clarified by filtration to fill the rectangular cup to the mark that will be found upon it. The cup and contents are then placed in the apparatus and the latter manipulated until the colors, as seen through the prism, are identical, when the percentage of excretion will be directly indicated on the scale. If, after adding the alkali, the coloration of the specimen is slight, showing small excretion of the phthalein, then the dilution should be carried only to 250 or 500 ccm. and the readings on the scale divided by four or two as the case may be. Again, at the end of the second hour, another such collection and examination should be made. Used as a differential test, the secretions of the kidneys should be separately collected by ureteral catheterization, for one hour from the time the urine from either side first shows discoloration.

As stated above, it is usual for the injection to be given intramuscularly, yet Furniss of New York has used, and continues to use, the intravenous route. Although requiring additional care and special attention to asepsis, he is enabled to produce more rapid elimination and exactness,—results which are extremely desirable to the physician performing this test as an office routine.

The following constitutes the picture presented by the cystoscope and colorimeter in the average case demanding the attention of the physician. As previously stated, tuberculous cystitis is associated sooner or later with renal involvement, in approximately seventy per cent of the cases, especially in males; and in cases where there is marked involvement of the trigone, tenesmus forms a very prominent symptom, making the introduction of the cystoscope a very difficult procedure, and entailing the patient considerable pain, especially in those cases of the neurasthenic type. The sphincter muscle is, therefore, markedly contracted, and offers considerable resistance to any form of instrumentation. Necessarily there is some traumatism, followed very often by hæmorrhage; and it has been asserted by excellent authority that cystoscopy occasionally gives rise to traumatism that is sufficient to act as a predisposing cause of vesical tuberculosis, where the bladder has been free from involvement in cases of renal tuberculosis until after examination. After washing the bladder, several times if necessary, to obtain a clear fluid medium, the fundus, walls, and trigone should be carefully examined. Usually the superior and posterior walls show no involvement, the trigone, especially the region surrounding the ureteral orifices, displaying the most marked evidences of the secondary infection. This consists in the presence of yellowish-white miliary tubercles surrounded by a congested zone. Some will be seen to have broken down into ulcers which are either single or multiple, show more or less infiltration according to duration, have thinly elevated edges, and irregular outlines. They are usually of small size and are frequently surrounded by other groups of miliary tubercles. The remaining mucous membrane is usually more or less congested, and may exhibit varying degrees of contraction, due to a frequently coexisting pericystitis emanating from an outward extension of the inflammation.

Having carefully examined the bladder, the next step consists in catheterizing the ureters and the pelvis of the kidney. The catheter is introduced further in the instrument until

its tip is seen to be slightly beyond the ureteral orifice in the field of vision. The deflector of the cystoscope is then manipulated until the catheter is directly over the ureter mouth; the catheter is inserted into the ureter and pushed on up into the renal pelvis. As in the case of the bladder, ureteral tuberculosis is in all cases a secondary descending process from the kidney, unless arising from contiguity, and consists, as in other regions, in the formation of miliary granulations affecting the mucosa. These granulations coalesce and undergo ulceration as the disease progresses, and it is not uncommon for the lumen of the ureter to be entirely obliterated, as more or less infiltration takes place. It is evident, therefore, that the ease of ureteral catheterization in these cases depends directly upon the duration and extension of the disease under consideration. Occasionally a case will present itself in which the passage of the catheter is an impossibility, and it must always be borne in mind when it occurs, in conjunction with typical evidences at the ureteral orifices, that there is a possibility of the ureter having been converted into a mere fibrous cord as a result of the deep-seated infiltration. Consequently there is a varying degree of impediment to the urinary flow on the affected side, and as the occlusion becomes more marked, a pyonephrosis develops as a result of the back pressure, together with a dilatation of the ureter behind it or the renal pelvis, and considerable atrophy of the kidney. These cases occasionally present the characteristic colic of nephrolithiasis or Dietl's crises, as a result of the passage of masses of débris from the kidney through the narrowed lumen, and it is therefore wise for the physician to be guarded in his diagnosis of nephrolithiasis and movable kidney, as an operation or autopsy performed later may reveal the true nature of the case.

As the catheter enters the renal pelvis an amount of urine, depending on whether or not a retention exists, is seen to emerge from the catheter mouth, which should be collected in a test tube for future examination. The urine is of low specific gravity, and resembles that obtained in cases of interstitial nephritis; and it is often no easy task to differentiate the two conditions from each other by the urinary findings alone, especially in the early stages. At this juncture, this will suffice as to the urinary findings, which will be taken up in detail when describing the condition in the kidney.

We have now arrived at the kidney, in which tuberculosis occurs as frequently as in all the other genito-urinary organs put together. The infection is always a secondary one, as the disease has manifested itself elsewhere in the body previous to its appearance here, or else it is a part of a rapid general constitutional infection. It is usually possible to elicit the history of an existing renal congestion prior to the advent of any tuberculous infection, and it is this congestion which presents a favorable predisposing factor in arresting the passage of the tubercle bacillus through the urinary tract, after it has reached the kidney by either the hæmatogenous or lymphogenous routes.

As in movable kidney, females in the third decade of life furnish the majority of cases seeking the advice of the physician. The right kidney appears to be more susceptible than the left, which will seldom become involved if its fellow is removed at a sufficiently early date. Two varieties are encountered: the miliary, which is characterized by the presence of miliary tubercles scattered throughout the renal tissue, and the caseating, which is characterized by the presence of cheesy nodules, surrounded by fibrous tissue, and a slight nodular enlargement of the organ. These nodules may be either single or so extensive as to entirely destroy the organ, converting it either into a fibrous mass or a useless shell.

In case both kidneys become involved, due to the procrastination of the patient in seeking medical advice, or to a delayed diagnosis, it is very frequent for different phases of the infection to be presented by the two kidneys. This is, as a rule, due to the difference in the duration of the disease, or to the presence of a mixed infection in the one, and a simple tubercular infection of the other. They may, therefore, exhibit a non-suppurating caseous degeneration on the one side (pyelonephritis) and a suppurating caseous degeneration on

the other (pyonephrosis). The kidney showing the suppurative process always produces symptoms of a more acute character, due to the greater activity of the pus-producing organisms present, and the consequent higher degree of inflammation which they produce. This one is always the larger of the two, and is the one which is the most distinctly palpable and tender upon external examination of the loin.

As to the symptoms presented, those of a reflex character are often the most pronounced, the bladder playing such an important rôle that the cystoscope becomes a diagnostic instrument of necessity. Vesical pain and tenesmus, associated with frequency of and burning on urination, and frequent absence of local pain often mislead one and point to vesical conditions; and many a case has gone to an untimely grave because of delayed diagnosis and consequent treatment being wrongly applied. Pain and tenesmus, however, are not so marked unless a very high grade of inflammation exists in close proximity to the sphincter, as in trigonitis. The frequency of urination is noted both during the day and night, and besides being associated with a distinct polyuria, is more marked than in the ordinary case of chronic cystitis; and the same may be said of burning on urination. The local pain, when present, is located in the loin, and is usually of a dull character, unless the renal process is very acute and the congestion very pronounced. The temperature of these patients follows very closely that presented by the average case of phthisis pulmonalis, and mixed infection is usually announced by the ushering in of sweating and chills.

If the urine presents typical indications of the disease, which in many cases it does not, the urinalysis chart may usually be depended upon to give evidence directly in relation to the stage of the progress of the disease. Thus a chart usually reads as shown herewith.

	Stage of Invasion	Stage of Development	Stage of Destruction
Amount	Increased	Decided increase	Increased
Specific gravity	Variable (1.015)	Low (1.012)	Low (1.010)
Color	Light	Very light	Very light
Reaction	Acid	Acid (faintly)	Alkaline
Albumin	Trace	Trace	Variable (dependent upon destruction of kidney)
Leucocytes	Present	Occasional	Present
Erythrocytes	Present	Present	Occasional
Epithelia	Renal, pelvic, no vesical as a rule	Renal, pelvic, no vesical as a rule	Renal and vesical
Casts	Hyaline	Hyaline	Hyaline, granular, epithelial and pus
Bacteria	None as a rule	None as a rule	Tubercle bacilli and cocci
Pus-cells	None	None	Present

Tubercle bacilli are usually not found in the average urine until the appearance of pus, and unless a specimen is stained with carbol fuchsin and later treated with alcohol, the smegma bacillus, which is morphologically almost identical with the tubercle bacillus, may be mistaken for it. In case no bacilli are found after two or three examinations, guinea pig inoculations should be resorted to that valuable time may not be lost.

Hæmaturia constitutes another very frequent symptom of renal tuberculosis, and has been compared to the hæmoptysis appearing in the pulmonary form of the disease. The hæmorrhage is not induced by jarring and motion of the patient, as is the case in nephrolithiasis, but very frequently occurs suddenly, without any apparent cause, disappearing in the same manner. It is of the terminal variety, and the blood is as a rule thoroughly mixed with the urine, although cases are not infrequent in which it is passed in the form of long slender ureteral clots. Hæmaturia, in one sense of the word, presents the most important objective symptom of the disease, in that it may be the only indication of its existence before secondary infection has taken place and suppuration begun. It behooves the physician, therefore, to always think of the possibility of an existing renal tuberculosis in any and all cases applying for treatment, in which hæmaturia exists as the only or most prominent objective symptom.

Although I, personally, do not favor the use of the tuberculin test, due to the fact that it has been conclusively proven that an old

encapsulated lesion may exist, and yet usually give a negative result, it nevertheless is used by several. It must be borne in mind by those using it, however, that a minimum dose only should be employed, as the maximum dose may give rise to a febrile reaction even in health.

It is now that the phenolsulphonephthalein functional test should be employed, and the relative activity of each kidney accurately determined. The solution is withdrawn from the ampoule as described in the foregoing instructions, and a tourniquet is placed about the arm, to cause the veins at the bend of the elbow to become more prominent. It should be remembered at this point that a mistake is often made by applying the tourniquet too tightly, as by so doing the arterial supply to the forearm is interfered with or cut off entirely, thus defeating the purpose for which it was employed. The needle of the syringe is then inserted into the median basilic vein, the tourniquet removed, and the solution slowly injected into the circulation. Previous to this time the cystoscope has been removed from the bladder, permitting the ureteral catheters to remain within the ureters. The ends are then placed in test tubes, which contain a five per cent solution of sodium hydroxide, and held securely by means of a Friedman combined cystoscope and test tube holder, to merely determine the time necessary for the phthalein solution to appear. If this method is not employed, the urine is collected and the percentage of phthalein excreted by each kidney determined by means of the colorimeter as previously described.

This dissertation was written with the idea in mind of enumerating the main factors which should be considered in the diagnosis of renal tuberculosis, and of describing some of the means of diagnosis which have been developed during the past few years, and not to dwell at any length upon the differential diagnosis, yet one would not be justified in ignoring this side of the subject entirely. Accordingly, those diseases for which tuberculous kidney is frequently mistaken may at least be mentioned in passing. The condition which resembles tuberculous kidney more than any other is nephrolithiasis, but this may usually be clearly differentiated from it, if one is careful in considering the history which may be elicited from the patient. The other conditions to be considered are movable kidney, cystic kidney, renal tumors, hæmorrhagic nephritis, and suppurative diseases of the kidney arising as a result of obstruction to the flow of the urine, and as a sequel to acute nephritis complicating the infectious diseases.

This brings us to the treatment, which may be summed up in a few words, and should be considered from an hygienic, dietetic, medical, and surgical standpoint. No matter what course is decided upon as being the wisest to follow, no time should be lost, since the patient will die of cachexia and uræmia, in approximately three years after the first appearance of its typical indications, if the disease is permitted to pursue its own course.

Unless it has been demonstrated that both kidneys are involved, and that insufficient normal renal tissue exists to properly carry on the work required by the entire economy, the hygienic, dietetic, and medical treatment should never be employed, except in very rare cases. If the case has been properly diagnosed before both kidneys have become involved, this expectant treatment is but a waste of time and energy, since it has been conclusively proven by such men as Rovsing, Senn, Squier, Willy Meyer, von Bergmann, Kronlein, and Guiteras that the surgical treatment of this condition is the only one holding forth any ray of hope. As to the surgical treatment, nephrectomy constitutes the procedure worthy of the most consideration, and has proved to be one of the most successful operations of major surgery.

Concisely, the nephrectomy should embody a free incision,—placing the ligature before the removal of the clamp to minimize the dangers of hæmorrhage,—removal of the ureter as low down as possible, and a thorough cauterization of the stump, as complete a removal of the fatty capsule as is feasible in order to lessen the liability of leaving behind a disease focus, and careful attention to the wound closure that the possibility of a future sinus may be lessened, as they are most resistant to all forms of treatment, and tend to retard the convalescence of the patient.

CONCLUSIONS

1. Ureteral catheterization is uncalled for when the tuberculous lesions about the mouth of the ureter are typically suspicious, and present difficulties on account of the frequently coexisting tuberculous cystitis.

2. Ureteral catheters demand scrupulous care in cleansing, and should always be tested before introduction.

3. A nephrectomy should never be performed unless an amount of normal renal tissue corresponding to at least one-third of the total renal tissue when in good health is present.

4. Vesical and ureteral tuberculous infection is always secondary to the renal condition.

5. Care should be exercised in diagnosing nephrolithiasis and movable kidney, as a colic similar to that occurring in these conditions may arise from the masses of débris which pass through an infected and narrowed ureter.

6. Interstitial nephritis and renal tuberculosis may easily be confounded with each other if the urinary findings alone are depended upon for diagnosis, as the two conditions resemble each other very closely, especially in the early stages.

7. Tuberculosis occurs in the kidney as frequently as in all other genito-urinary organs put together. The right organ, in females in the third decade of life, furnishes the majority of cases.

8. Reflex symptoms are most pronounced, vesical symptoms usually predominating and often pointing in this direction as the seat of the trouble.

9. Tubercle bacilli are usually not found in the average urine until the appearance of pus.

10. Renal tuberculosis should always be thought of in any and all cases in which hæmaturia exists as the only or most prominent objective symptom.

11. Nephrectomy is the most successful operation in the realm of major surgery, and offers the only satisfactory means of dealing with this condition, unless both kidneys are involved or insufficient renal tissue exists. The expectant treatment is but a waste of time and energy in the early diagnosed case.

If I have succeeded in arousing interest in this class of cases, have stimulated your mind to further investigations, and have clearly demonstrated the numerous advantages and necessities of the latest methods of diagnosis, I shall feel that the purpose of this paper has been well accomplished.

OPERATIVE TREATMENT OF ANEURISM OF THE AORTA

By H. KÜMMELL, M. D., Hamburg-Eppendorf, Germany

THE operative treatment of aneurism of the aorta has thus far been limited mostly to operative procedures affecting the disease indirectly. I recall Brasdor's operation, the ligation of the subclavian and carotid for the treatment of aneurism of the thoracic aorta, with its different modifications, Gatsch's method of placing a thin band of aluminum 2 cm. wide around the distended abdominal aorta, and Halsted's method, which consisted in cutting strips from the aorta of a dog and applying them spirally to that of another dog. Matas and Allen attempted to narrow the thoracic aorta by making folds in its walls. They used this method successfully on a number of dogs and believe that it can probably be used on man. Macewen and others inserted a needle into the sac of the aorta and scratched the posterior wall in order to clot the blood; Ruperti, Collins, Braine-Hartnell, and others laid bare the abdominal aorta and inserted a long, thin wire. These are examples of the different methods for the treatment of aneurism of the aorta that have been used in animal experiments and on man, and many others could be added to them.

Tuffier operated on four patients for aneurism of the thoracic aorta by the following method: He made a temporary resection of the left anterior wall of the thorax over the second and third sternocostal cartilages, under positive-pressure anæsthesia, located the beginning of the normal lumen of the aorta at the boundary of the aneurismal sac, clamped off the latter with a forceps especially made for this purpose and resected it. This was followed by double suture by Carrel's method. One patient lived 17 days, one died from secondary hæmorrhage resulting from infection, one from hæmorrhage, and in the fourth case the operation could not be carried out.

So far as I know the direct operative treatment of an aneurism of the thoracic aorta that had already ruptured, has not been performed, or at any rate only very rarely, so that the method used for this purpose ought to be of considerable interest.

F., the 52-year-old patient was admitted to the medical section of our hopital for an aneurism of the thoracic aorta; two years before, he had taken treatment in New York for syphilis. He left the hospital of his own volition and returned a few weeks later on account of increasing pain and a tumor that suddenly appeared on the left side of the back.

The patient, who appeared to be suffering, complained of keen pains irradiating toward both sides of the back and toward the lower extremities, as well as of a painful swelling on the left side of the back below and upon the costal arches. This had recently been developing gradually. The patient showed a pulsating tumor as large as two fists to the left of the spinal column reaching from the crest of the pelvis up over the costal arches. The pulsation, which was synchronous with the radial pulse, involved the entire tumor, which seemed to be covered only by the skin. The diagnosis of a ruptured aneurism of the aorta was not difficult. The röntgen picture gave no accurate information as to whether the aneurism was above or below the diaphragm, as the shadow was very diffuse. As the patient was getting weaker all the time and death was certain from hæmorrhage, we made an attempt to save this rather hopeless case by operation.

The plan of operation was to lay bare the aorta as much as possible retropleurally and retroperitoneally, and after compressing it to remove the sac and close the opening in the artery by suture. Therefore several ribs (the fourth to sixth) were resected at the spinal column, care being taken to spare the pleura, and a large enough opening produced in the wall of the thorax so that the hand could easily be inserted. The pleura, which was somewhat thickened, was not injured, so that it was not necessary to use the positive-pressure apparatus that was held in readiness. The pleura was pushed forward and the thoracic aorta laid bare without difficulty. I know this region very well from having performed several operations for carcinoma of the intrathoracic portion of the œsophagus, and I have often been surprised in this operation to find how easy it was to dissect the carcinomatous œsophagus from the aorta, provided the case was operable. The aorta was now laid bare without difficulty as far as the sac of the aneurism, which was found to lie above the diaphragm. A rubber tube was laid under the thoracic aorta in order, if necessary, to utilize it for a temporary closing of

the artery. We did not have to use it, but produced the necessary compression with the fingers. The thoracic aorta was compressed between the thumb and index finger of an assistant at the diaphragm and the upper boundary of the pulsating tumor that was now covered only with a thin skin; the sac of the aneurism was laid bare with a long incision, the tear which was already present enlarged, and masses of clot removed. In order to be able to see the lower part of the normal aorta at the edge of the sac, we split the diaphragm and laid bare the upper part of the abdominal aorta retroperitoneally, so that there was a free view of the field of operation, including the thoracic and abdominal aorta and the sac of the aneurism. The sac of the aneurism was larger than the fist and the original tear in it was 10 cm. long. I passed my index finger into the normal lumen of the aorta above and below the aneurism from the inside of the sac and trimmed the latter so that a vessel corresponding to the normal lumen of the aorta was formed. The aneurism had caused a bulging chiefly of the posterior wall of the aorta, and had left the part of the artery lying immediately behind the spinal column comparatively unaffected. The 10-cm.-long slit in the new-formed aorta, that was now freely exposed, was closed with a continuous suture and the digital pressure somewhat relaxed. As a little blood still emerged from some places, a second continuous suture was applied over the other without any special difficulty. During the compression the blood-pressure had risen to double its normal height from the exclusion of the greater part of the circulation.

The digital compression of the aorta had lasted about twelve minutes. As it was gradually relaxed and finally withdrawn altogether, the suture was found to be sufficient. Not a drop of blood exuded from the line of suture. The pulsation in both femorals was strong and the pulse in the dorsalis pedis could be distinctly felt. For ten minutes we observed the suture, meanwhile cleansing the wound cavity, and found that it was firm and tight. The time of the operation was unnecessarily increased by the tamponing of the wound cavity that was contemplated at first. The wound was then closed; the pulsation in the lower extremities was good. The operation had taken about an hour, and after its completion the patient was in comparatively good condition, which is to be attributed to the fact that he was anæsthetized by the intravenous administration of ether, and the heart was kept strong by the continuous influx of salt solution and ether. But he gradually grew weaker and weaker, and finally died of heart failure.

From my numerous successful experiences in suturing the aorta and other vessels, which have been previously reported, I believe that the tendency of the vessels to heal is relatively great and that suturing them is not technically so difficult as is ordinarily supposed.

In the specimen a great cavity can be seen which the aneurism had produced, and a shallow depression that it had made in the bodies of the vertebræ. The double suture of the aorta, 10 cm. long, can also be seen. Looking at the specimen from the inner side of the aorta, it can be seen that the suture has reëstablished almost a normal condition of the vessel, and that the one place where there is still a little pouching out could easily have been overcome by a few deep sutures, which hardly seemed to be necessary at the time of operation.

Though this case was not successful, as the patient died of exhaustion, yet it seems to me to be significant and instructive for future cases of operative treatment of aneurism of the aorta. It shows that it is possible to lay bare the aorta retropleurally and retroperitoneally, which overcomes a great part of the danger of pneumothorax arising from opening of the thorax. It shows, moreover, that the ruptured sac can be removed under digital compression of the aorta, an almost normal vessel created and firmly sutured, and that other measures for strengthening the suture could very well have been carried out.

I would recommend that the line of suture be covered with a broad strip of fascia which should be fastened with a few fine silk sutures to the vessel-wall. This would increase the time of the operation only a little and would markedly increase the protection of the suture.

It is to be hoped that this operation may be carried out successfully in similar cases of aortic aneurism.

DYSMENORRHŒA ESSENTIALIS[1]

By THEO. J. DOEDERLEIN, M. D., Chicago

IF one bears in mind that, according to Tobler and Engelmann, 50 to 80 per cent of our American girls are affected with dysmenorrhœa, that this affliction not only is the source of great pain and discomfort, recurring periodically with clockwork certainty, but also reduces the economic value of so many working-girls, the importance of careful study and investigation is brought home to us. Why it is that American girls are subject to this disease in greater number than their European sisters is somewhat problematical, as many of our working-girls come from Europe, where they enjoyed good health. If we remember, however, that our country really was the pioneer in giving to women employment in professional as well as business lines, which entails greater responsibilities and more concentration of mind and application to duties, with total disregard for the weaknesses and disabilities womanhood is heir to, we may in a way explain this greater prevalence.

There was a time when all pelvic pains accompanying menstruation would be called dysmenorrhœa. It is well known that all pathological conditions in and about the adnexa and uterus may become intensely troublesome during menstruation. Thus simple, tubercular, and specific salpingitis; oöphoritis of all types; myomata of the uterus, either by pressure or obstructing the outlet; old perityphlitis, and appendicular inflammation,— may become greatly aggravated during menstruation. This should be no reason why one should, at the time of menstruation, change the nomenclature of these conditions. We have other painful conditions remote from the pelvis, such as sick headache, neuralgia, stomach disorders, etc., which in a person subject to them may become more conspicuous during menstruation, with absence of pelvic pain. We would not think of calling such pain dysmenorrhœa. It is obvious to me that the term "dysmenorrhœa," really meaning *difficult menstruation*, should be restricted to a certain syndrome of symptoms of specific character; that, in other words, it is a well-defined pathological entity, and has a treatment entirely distinct from that of other diseased conditions of uterus and adnexa.

The symptoms, all of which are well known, but usually not grouped and interpreted as belonging to essential dysmenorrhœa, are the following:

1. *Gradual development.* The age of puberty is not, as a rule, the time dysmenorrhœa first appears. Usually it begins with gradually increasing severity a few years after menstruation appears. Of importance is the fact that it ordinarily appears in virgins who never were exposed to the danger of pelvic infection. It is, moreover, significant that in girls who practice sexual relations dysmenorrhœa is rarely found. If anything, this would establish the non-inflammatory nature of the disease.

2. *Type of pain.* A few hours to even a day before the beginning of menstruation a lancinating, colicky pain, radiating from uterus to back, sets in. Occasionally the pain does not appear until flow is established. Often the pain is most agonizing, the patient lying in bed with flexed knees, pinched expression associated in most cases with headache, nausea, and vomiting.

3. *Intermenstrual freedom.* With most pelvic diseases the woman is more or less conscious of existing trouble during interval, while a characteristic of essential dysmenorrhœa is the entire absence of symptoms during interval. Such girls may enjoy any outdoor sport or physical work, usually productive of aggravation or recurrence of symptoms due to inflammatory disease, without the least after-effects so far as pelvic condition is concerned.

4. *Sensitiveness of uterine mucosa.* It is a well-known fact that the mucosa of the healthy uterus is not very, if at all, sensitive. *Per contra*, passing a sound into the uterus or

[1] Read before the Chicago Gynecological Society May 15, 1914. (See discussion, p. 255)

even very slightly touching the cervical mucosa of a dysmenorrhœic uterus produces great pain. In fact, very often nausea and vomiting, headache and faintness, develop in the same manner as at the oncoming menstruation. Repeatedly I observed this in my patients. Patients would tell me, "This is precisely the pain experienced during menstruation." Especially sensitive is the region of the internal os and cornua of the uterus. I often noticed that the slightest touch of the os externum would be keenly felt by the patient, who did not know I had a sound in my hand.

5. *Mittelschmerz.* This peculiar phenomenon I desire only to mention in so far as it is pathologically and clinically analogous and explanatory to dysmenorrhœa. Perhaps some of us have seen this rare condition in which exactly in the middle of the interval a pain occurs of dysmenorrhœic type, disappearing without further symptoms. Gottschalk calls this condition "asynchronous ovulation," the ovary having a dense capsule with difficult and painful rupture. More corroborative of our view in the question of essential dysmenorrhœa is Veit's explanation: he calls it "middle ovulation," the endometrium not being sufficiently loosened, "aufgelockert," to respond with depletion. Veit cites a most instructive case of a 30-year-old woman who would have the typical "mittelschmerz" pains during one interval, while in another she would have a bloody flow for a day without pain.

6. *Discharge of membranes.* This leads us to the subject of menbranous dysmenorrhœa, which really is part of the study of the etiology of essential dysmenorrhœa. I believe that membranes are much more frequent than is usually supposed; that the extent to which the mucosa is destroyed varies within wide limits in different persons and even in the same person at different periods of life; that if we carefully examine menstrual discharges, we can, in the majority of instances, find proof of exfoliation of the superficial layer of uterine mucosa, varying from small shreds made up of a few mildly hydropic stroma cells to complete coagulation, necrosis, and exfoliation of endometrium.

It would be of value, but beyond the scope of this paper, to go into the microscopical study of the uterine mucosa during the entire menstrual cycle, which, as is known, consists of the quiescent, the constructive, the destructive, and the regenerative stages. Suffice it to say that the stroma, which in the stage of *construction* has become œdematous to jelly consistency with wide capillary tracts, during the stage of *destruction* becomes hæmorrhagic by diapedesis, due either to *vis a tergo* or, as Young maintains, a dragging out of cells by osmosis. Young's theory, in his own words, is as follows: "There is an active dragging out of cells by a crystalloidal element which brings about an osmotic pressure-discrepancy between the protoplasm of the stroma and the blood in the vessels, to readjust which an outflow of fluid takes place from the lumen of the vessels into the stroma cells." These hæmorrhages form lacunæ in the stroma, often large and dissecting, pushing aside the stroma-cells and lifting off the superficial compact layer before it has time to become vascularized, or, as Schoenberg puts it, "aufgelockert," until the blood finally has found its way into the uterine cavity either by way of glandular openings or by breaking through the surface epithelium. Considering this physiopathological process, we can readily understand the frequent appearance of shreds in the menstrual discharges. But to revert to the point at issue, I wish to say that, if shreds and membranes so often are discharged during painless menstruation, why should the discharge of membranes in the condition known as membranous dysmenorrhœa be the cause of pain rather than the etiological factors of essential dysmenorrhœa? Very interesting observations have been made by Heap and Van Herwerden on monkeys and apes with regard to painless discharge of menstrual membranes, to consider which would lead too far. In my opinion, it seems certain that the discharge of membranes often is a symptom rather than a cause of dysmenorrhœa, just as we have membranous colitides of neuropathic, or, as some maintain, toxæmic, origin.

7. By some observers, endometritis is regarded a symptom of dysmenorrhœa. There

undoubtedly may be an endometritis concomitant with dysmenorrhœa, but I would by no means believe it a symptom. We have seen that the destructive stage of the menstrual cycle simulates a severe endometritis to perfection, except that a complete restoration *ad integrum* follows immediately during the stage of regeneration, leaving nothing pathological but the highly sensitive mucosa. If anything, we might designate this a non-inflammatory physiological endometritis produced, perhaps, by the ovary elaborating an increased amount of that biochemical substance called hormones, which, in turn, produce this increased determination of blood to the uterus. Many observers examined large numbers of menstrual membranes (e. g., Olshausen, 62); only an average of 68 per cent showed signs of disease of the endometrium.

We will now briefly take up the various theories of etiology in their chronological order. The older observers invariably upheld the obstructive theory. Thus Marion Sims made the statement: "Nulla dysmenorrhœa nisi obstructiva." Dr. McIntosh claimed twenty-four cures out of twenty-seven patients by dilatation and was an ardent adherent of the theory of mechanical obstruction to outflow. On reasoning a little, his cures may readily be explained.

Schauta distinguishes an organic, congestive, and neuralgic form.

Gusserow describes ovarian and uterine dysmenorrhœa, as also the mechanism of the latter, regarding anteflexion important.

Olshausen finds two causes for acute angular anteflexion and obstruction; namely, (1) hypoplasia and infantilism, (2) premenstrual swelling of mucosa and endometritis.

Gebhart, Theilhaber, and Victor Schulze maintain that the pain is due to pressure within the uterus. The first believes that pain is produced by increased destruction of mucosa, œdema, stretching and pressure on uterine nerves; the second, by a spastic contraction of circular muscle-fibers of the internal os, analogous to pylorospasm; the last explains dysmenorrhœal pain by capsular tension, "Kapselspannungsschmerz," which is premenstrual, and he regards it due to presence of connective tissue in the layers of infantile uterine muscle, and contraction pains, "Wehenschmerz," which is menstrual and the expulsive effort of the uterus.

From these theories, which in the main are formulated on a mechanical basis, there is a transition of modern authors to nervous theories, of which I found Vedeler to hold the most extreme views. He designates dysmenorrhœa the stigma of hysteria. A more conservative view is taught by Menge, who believes in an underlying uniformity of etiology for all types; namely, a neuropathic condition of the patient, magnifying pains which, given a normal nervous system, cause little or no discomfort.

Krönig and Veit seem to hold the *aurea media*, admitting the possibility of the presence of a neuropathic hypersensitiveness with little or no apparent local disturbance, but firmly maintaining that there are many cases in which local conditions are productive of the violent pain.

There are, as we observed, various types of dysmenorrhœa. We find cases in which the anatomical element is predominating, the patient being a pale, weak, and nervous-appearing girl, with infantile uterus and elongated cervix, anteflexion, and perhaps retroposition of uterus. Then we have cases in which the neuropathic or psychopathic element is in the foreground, the patient, usually a robust, well-nourished girl, having a well-developed uterus with little or no misplacement.

Although there undoubtedly is one underlying cause for all types of dysmenorrhœa, it might be of advantage as far as the management and treatment is concerned to classify the various cases according to their most conspicuous features.

Those cases in which the anatomical element is closely associated with, and very likely a sequel to, a neurosis I would designate as the anatomiconeurotic type. This class recruits its members out of the ranks of shop and office girls and students. This class of girls apply themselves with great intensity to their work and studies, and in these cases the general invalidism is *secondary* to long-continued mental and physical fatigue and, as is now believed by some observers, a

toxæmia arising from the thyroid gland, a tubercular focus or coprostasis.

In the second class of cases, the psychoneurotic type, anatomical changes are conspicuous by their absence. The girl is healthy and robust-appearing, with well-developed genitalia. This type is found especially among people in affluent circumstances and society girls possessed of an excitement and pleasure seeking mania, and girls of an inherited neurotic tendency. We could also include in this class the dysmenorrhœa produced by long-continued repression of sexual instinct. We know that at the age of puberty dysmenorrhœa is practically never met with. The girl up to that time leads a fairly natural life and develops symmetrically. Later on, her mother's daily warnings and corrections, social conventionalities, and her own studies induce her to repress her sexual instincts, which gradually produces lessening of sexual feeling or even a stamping out of sex. I remember in this connection a university student of the highest literary attainments who bewailed the fact that her ardent sexual feeling at the age of seventeen was so radically suppressed by sheer power of will that now, at the age of twenty-five, she regarded herself as practically sexless. She had passed through a condition of dysmenorrhœa and had been amenorrhœic for the last two years.

Most observers agree that girls, who seek to gratify their sexual feeling by conventional contact with the opposite sex, as in games, walks, drives, and dancing, not speaking of those who practice illicit relations, rarely are affected with dysmenorrhœa.

Thus I would say that neuropathy and idiosyncratic tendencies play an important rôle in the production of essential dysmenorrhœa, but that local anatomical and physiological conditions deserve equal consideration.

Our present state of knowledge of biochemistry and also our clinical experience do not warrant the assumption that the remote cause of *all* types of dysmenorrhœa is a toxæmia, as I have heard mentioned.

The treatment concerns itself with two phases: the curative and the preventive. The preventive involves a difficult sociological question, which could not be considered in this paper. The curative treatment is general and local. The general treatment, besides hygiene, diet, and tonics, may consist in the administration of tuberculin or thyroid extract, the latter recommended and described by Dalce. For local treatment the intrauterine stem-pessaries of the Watkins or Dickinson type have met with some favor. I have used them in a number of cases with rather indifferent result. Dilatation and systematic sounding in my hands have been most successful. I use a male urethral sound No. 13 or No. 14. The main object, to my mind, of pessaries or sounding is blunting the hypersensitive mucosa, and not dilatation as was formerly believed.

Treatment of the attack consists, *first*, in relieving congestion. This is done by hot applications, hot sitz baths and hot douches. *Secondly*, by relieving severe uterine contractions, for which the well-known hydrastis, viburnum, and opiates are used.

BIBLIOGRAPHY

1. Rev. Mens. de Gynéc., d'Obstét. et de Pédiat., Par., viii, No. 11, p. 641.
2. HEAPE, M. A. The Menstruation of Semnopithecus Entellus. University, Cambridge (Balfour Student), Proc. Roy. Soc., 1893, liv.
3. GEBHARD. Referred to by Hitchman, F., and Adler, L.: Die Lehre von der Endometritis. Ztschr. f. Geburtsh. u. Gynäk., 1907, xl.
4. YOUNG, JAMES. The Structure of the Stroma of Endometrium and its Bearing on the Menstrual Changes. Brit. M. J., 1910, Oct. 22.
5. MEERDERVOORT. Die normale und menstruirende Gebärmutter-schleimhaut. Inaug. Dis., Freiburg, 1895.
6. Veit's Handbuch der Gynäkologie.
7. MANDL. Beitrag zur Frage des Verhaltens der Uterusmucosa während der Menstruation. Arch. f. Gynäk., 1896, iii.
8. GOTTSCHALK. Die Balneotherapie bei Menstruationstörungen. Abstr., Med. Klin., Berl., 1910, March.
9. KELLY and NOBLE. Operative Gynecology and Abdominal Surgery.
10. COHNSTEIN. Über vaginitis exfoliativa und dysm. membranacea. Arch. f. Gynäk., 1881, xvii.
11. VAN HERWERDEN. The Physiology of Reproduction, p. 96.
12. LOCKHART. Treatment of Dysmenorrhœa. Montreal M. J., 1896–1897.
13. NORRIS, C. C., and BARNARD, E. P. Dysmenorrhœa in Nulliparous Woman without Gross Local Pathologic Lesions. Am. J. Obst., N. Y., 1910, lxi.

CALCIFIED FIBROMA UTERI COMPRESSING THE SIGMOID COLON[1]

By GEORGE DE TARNOWSKY, M. D., Chicago
Surgeon to the Cook County and Ravenswood Hospitals

CASE HISTORY. Mrs. C. A. Y., married, 71 years old, consulted me August 2, 1912. In her early married life patient gave birth to two children, both of whom died in infancy. Menopause at 43. Her family physician, Dr. J. P. Esch, of Daytona Beach, Florida, reported that for a period of about thirty years patient had suffered from repeated attacks of pelvic peritonitis, also of colitis. All of these attacks were treated medically. For the past two years, patient has complained of rectal pain and tenderness, with inability to move the bowels without a preliminary colonic flushing. She has lost thirty-five pounds in weight during the past year, this being, at least in part, due to the marked restriction in diet which the patient imposed upon herself in order to lessen the number of bowel movements.

On examination, patient does not present the appearance of cachexia. A cataract of the left eye has been present for several years. Examination of the vascular system reveals a high degree of arteriosclerosis. On palpating the abdomen a hard tumor, the size of an orange, can be felt in the left lower quadrant. It is only slightly movable and is painful when moved or pressed upon. The vagina was so atrophied and rectal tenesmus so pronounced that examination was unsatisfactory. The cervix could be palpated, but I was unable to identify the fundus. Pressure from above on the tumor mass caused slight movement of the cervix. The rectum was contracted and very tender, and both internal and external hæmorrhoids were present. A tentative diagnosis of carcinoma of the sigmoid was made and an exploratory laparotomy advised and accepted. Patient entered the Ravenswood Hospital, August 21, and was operated on August 23, 1912. Under ether narcosis, I was able to introduce a Kelly proctoscope for a distance of six inches, before meeting any resistance. The lumen of the bowel appeared normal. The hæmorrhoids were rapidly removed prior to opening the abdomen. The peritoneum was opened through a left rectus incision. When this was done the uterus was found drawn over to the left side of the pelvis, the lower uterine segment being elongated and atrophied. From the fundus uteri emerged a sessile calcified fibroid, the size of an orange, which rested upon the sigmoid and was adherent to it over an area 1½ x 2½ inches. The adhesions were broken up, the denuded area on the sigmoid covered in by a running catgut stitch, and a supravaginal hysterectomy performed.

The colon was somewhat thickened both above and below the site of compression, but no lymphatics could be palpated. Normal saline was given intravenously while closing up the abdomen, as patient was in profound shock. She remained in a critical condition for three days, but made a slow and uneventful recovery, leaving the hospital three weeks from the date of the operation.

Her physician wrote to me in December, 1912, reporting a gain of six pounds and freedom from her former marked constipation; but his patient was still subject to the same syndrome of arteriosclerosis; i. e., dizziness, dyspnœa, and tachycardia on exertion. No further report was received from the patient or family doctor until February, 1914, when Dr. Esch reported that the patient had been sinking rapidly and that he had lately been able to palpate a tumor mass in the left side of the pelvis. She died a few days later, no post-mortem being obtained.

From the foregoing history it is reasonable to diagnose the case as one of intestinal compression caused by the calcified fibroid, with secondary carcinoma of the colon. In view of the subsequent history, it is probable that carcinomatous infiltration of the sigmoid was about to take place, or had already occurred, at the time of the operation. Resection of the sigmoid was, however, out of the question, the patient being in an extremely precarious condition throughout the operation.

The gross specimen, which was exhibited before the North Shore Clinical Society in November, 1912, and which has since that time been mislaid in the hospital laboratory, was that of an atrophied uterus, with a markedly elongated — almost pedunculated — lower uterine segment having attached to its posterior wall and fundus a totally calcified sessile fibroid, measuring 10x8x6½ cm. and weighing, with the uterus, 750 gm. The surface which lay on the sigmoid was totally denuded and had the appearance of a small mass of coral rock; the balance of the calcified fibroid was covered by a thin layer of tense connective tissue which also held it firmly to the uterine fundus. No sections were made, because, as above stated, the specimen disappeared and could not be found again.

Historical. It is interesting to record the fact that Hippocrates, in Book 5, Chapter 12, mentions calcified fibroids of the uterus. Roux, in France, discovered the origin of these

Read before the Chicago Gynecological Society, May 15, 1914. (See discussion, p. 254)

tumors in 1809, and Meckel, in 1818, recorded their clinical characteristics.

Frequency. A review of all the cases reported to date forces one to the conclusion that calcification is the rarest of all the degenerations which uterine fibroids may undergo. Inasmuch as the tendency of the times is to diagnose and operate upon uterine fibroids much earlier than has been the custom in the past, it is reasonable to presume that "womb stones" will, in time, become an almost unknown curiosity. The clinical history of my patient, for example, would tend to show that she had suffered from her fibroid for a period of thirty years or more, but no diagnosis of her condition had ever been made prior to 1912, because all of her attacks of "pelvic peritonitis" had been treated symptomatically, without an adequate preliminary examination.

While realizing the futility of attempting to present exact percentages, the sum total of the cases reported within the past ten years gives us, I believe, fairly valuable data. Of the combined cases of uterine fibroids which came to operation, reported by Werner (1), Ludlow (2), Ellice McDonald (3), Scharlieb (4), Tracy (5), Dorsett (6), and Noble (7),— 6496 in all,— 182, or approximately 3.5 per cent, had undergone calcareous degeneration. J. T. Everett (8) was able to find only 33 authenticated cases reported in the literature from the days of Hippocrates up to the year 1879. In 1901, Guibé (9) had increased the number to 81 and added four more observations, making a total of 85. A. Bernardie (10), in 1911, reviewed Guibé's 85 cases and added four more. Since the publication of Bernardie's thesis, in 1911, I have been able to find reports of only nine additional cases, among which one or more of Dorsett's and of Werner's cases may have been included in previous statistics. The cases of Nadel (11), Poucher (12), and Lewers (13), as well as my own case, must be added to Bernardie's total. It is, therefore, certain that there are less than two hundred authentic reported cases of calcified fibroid in the literature.

Pathological anatomy. Approximately 79 per cent of all calcified fibroids are either interstitial or subserous, the latter variety being slightly more common. The so-called "womb stones," i e., calcified fibroids lying free in the uterine cavity, are found in 18 per cent of all cases. In all probability they represent interstitial fibroids whose blood supply has gradually become occluded, and having undergone calcification, produce pressure necrosis of the adjacent mucosa and finally drop into the cavity of the uterus. The calcareous fibroids lying free in the abdominal cavity, such as those reported by Dorsett, in which case the unattached stone was wedged in between the bladder and rectum; by Harris (14), in which the mass lay in the pelvis, adherent to two loops of ileum but devoid of blood supply; by Walther (15), in which the stone was completely detached from the uterus and adherent to the mesocolon; and by Lewers, in which the tumor lay in Douglas' pouch — are all pedunculated fibroids whose pedicles had gradually atrophied and become absorbed. Peraire (16) states that calcification of an intra-uterine pedunculated fibroid is very rare, because its blood supply remains adequate. Nevertheless, Keiffer (17) reports the history of a patient 61 years old who had been repeatedly curetted for metrorrhagia, with the removal, by the curette, of many small calcified fibroids. She finally submitted to a laparotomy. Sarcomatous degeneration of the uterus was found at operation, with metastases in the abdominal wall. The patient succumbed to sarcomatosis.

Chemical composition. Calcified fibroids are essentially composed of phosphates and carbonates of lime. Ammonium or magnesium phosphates are rarely present,— a point of diagnostic importance which will help to differentiate them from vesical or renal calculi. Bernardie gives the following percentages: tri-basic calcium phosphate, 85 to 90 per cent; carbonate of lime, 5 to 15 per cent; sulphate of lime, 0.05 to 1 per cent.

The macroscopic appearance varies greatly, depending principally on the progress of calcification. This, in the vast majority of cases, begins centrally. Dudley (18) reported the removal of a calcified subserous fibroid which consisted largely of a thin, hard crust which felt so much like a fœtal head, even to

the sutures and fontanelles, that he at first hesitated to open the abdomen. Withrow (19) removed a subserous fibroid from a 50-year-old patient, which consisted of a fairly smooth calcareous shell one-fourth inch thick, containing semisolid pulpy material. In Lewers' case, the completely detached tumor consisted of a calcified shell containing hyaline material. Bernardie states that, after the shell is formed, the enclosed fibrous tissue may gradually become infiltrated by calcareous granulations, or may even completely atrophy, thus forming an empty shell. It is self-evident that, once the calcareous shell is complete, no further blood-supply can reach the fibroid, and its contents must necessarily undergo some form of necrobiosis. In the central or common type of calcification, the process begins as a deposit of phosphatic granulations the size of a millet seed. These tend to coalesce and spread peripherally, somewhat like a spider's web. This depends on the fact that the calcareous deposits primarily occur in the immediate vicinity of the fibrous septa along which the blood-vessels pass. These calcified radiations may gradually coalesce forming ultimately a compact, extremely hard tumor of white or whitish-yellow color. Should the stroma entirely disappear, the tumor loses its granular aspect; on section it is smooth, polished, and resembles eburnated osseous tissue.

"The whole arrangement of the fibrous septa and capsule may be reproduced in the lime salts. More commonly the spaces between the septa do not calcify, but disappear by some other degenerative process, giving the calcified part a porous, worm-eaten, or coral-like appearance." — Dudley (20.)

The denuded area of my specimen was whitish-yellow in color, and lobulated. Under a magnifying glass one was forcibly reminded of a series of mole-hills. On striking it against a solid body, it gave the flat sound of a solid stone, and was extremely hard. There was no capsule over the posterior superior portions, but the fibrous septa and the remains of the capsule held it firmly to the fundus uteri.

Bernardie states that "in a few rare cases genuine bony formation takes place, with bone-cells and a primitive haversian system.

Thorne (21) found an oblong tumor of stony hardness attached to the pubic arch and forming part of the anterior bladder wall. It was the size of a hen's egg, and one of the calcified areas consisted of bone-cells. The location of this tumor makes the possibility of its being a vesical calculus at least suggestive. A chemical analysis might have cleared the diagnosis. From a purely histological standpoint, it is hard for me to understand how genuine osteoblasts could appear in a degenerated fibroid. Nevertheless, Cornil (22) declares that "ossification of calcified fibroids is exceptional, but may occur."

Histology. There is always a stroma of muscle and connective-tissue fibers containing calcified plaques. The first change which takes place is the gradual disappearance of the muscle-cells, which are replaced by connective tissue. The latter than becomes infiltrated by deposits of lime salts (phosphates, etc.). In the final stage, the blood-vessels become obliterated, the organized elements lose their structure, undergo necrobiosis, and form an amorphous stroma in which, microscopically, no anatomic details remain.

Age. The youngest patient was 32. This is Thorne's case, which, as previously stated, is of somewhat doubtful origin. Dudley's patient was 35. With these two exceptions, all of the cases whose reports I have been able to study were those of patients well past the menopause.

Pathogenesis. The exact biochemical changes necessary for the calcification of a fibroid are at present totally unknown. The single factor which stands out prominently in all of the carefully reported cases is that of cardiovascular disturbances. Arteriosclerosis of the uterine arteries is essential to calcification. Analyzing the cases of uterine fibroids reported by Webster, Boldt, and Fleck, to which list he added several occurring in his own practice, Doane (23) brought out the fact that an average of 38 per cent of all cases showed marked cardiovascular changes. A contributing factor is suggested by Sampson (24), who studied the blood-supply of uterine myomata. He states that there are frequently no veins in these tumors, and that, at best, they are never as abundant as in the myome-

trium. This condition would naturally favor stasis and tend to produce regressive changes.

As a result of this twofold circulatory disturbance, degenerative changes—hyaline, fatty, or waxy—take place in the fibroid. The necrobiotic tissues contain phosphoric acid, fatty acids, and certain proteids having a special affinity for calcium. Absorption being deficient,— even absent,— the calcium salts in suspension in the blood come in contact with the phosphoric acid and are precipitated as tribasic phosphates. Ludlow states that "the calcium salts are held in solution or in suspension by the proteids, either as carbonates and phosphates or as calcium-ion-proteid compounds — perhaps both. This suspension is in an unstable condition, possibly only because of the extremely small proportion of calcium in the blood (1:10,000).

Bernardie's ingenious theory is the following:

"Arteriosclerotics always present nutritional disturbances, manifested especially by an excess in the blood of organic and inorganic substances, especially calcium salts. These poorly soluble salts, being in excess in the blood, are readily precipitated. In the fibroid, local vascular changes lessen the blood-supply and thus bring about a real dehydration of the cellular protoplasm. As a result of this dehydration, the carbonates and phosphates of lime are present in oversaturated solution in the protoplasm, and are precipitated in the form of minute granules which rapidly coalesce. Arteriosclerosis thus plays the principal rôle in calcification of fibroma because —

"(1) It causes nutritional disturbances. (2) It brings about local circulatory disturbances favoring a dehydration of tissues and precipitation of inorganic salts. The process is identical with that observed in chronic gout or in arthritis deformans."

Neither Ludlow nor Bernardie has taken into consideration the fact that in order to regress to the point of calcification, the fibroid must remain aseptic. In the presence of infection — from the colon bacillus or other pathogenic bacteria — the capsule or serosa is invaded, and further changes, other than those due to bacterial infection, become impossible; in other words, calcification only progresses so long as the tumor remains sterile. This probably accounts, in part, for the rarity of calcified fibroids.

Clinical symptoms and diagnosis. Inasmuch as calcification of a fibroid is a slow biochemical process, there are only two factors which may bring about subjective symptoms that can be considered as pathognomonic of the change. These are: (*a*) Increase in the weight of the tumor, and (*b*) displacement of the tumor due to its increased specific gravity, and also, in all probability, to a decrease in its size, with atrophy or disappearance of its pedicle. In reviewing the comparatively few careful reports in the literature, one is forcibly struck with the fact that a majority of these patients sought relief from some rather sudden complication, having previously suffered for years from a mild degree of compression phenomena. Acute intestinal obstruction, anuria or dysuria, peritonitis, perforation of the uterus (Lesné et Lagane [25]), are a few of the phenomena which may lead to a correct diagnosis. The ordinary train of symptoms common to fibromata need not be discussed in this paper.

It seems probable, however, that the complications of a calcified fibroid come on more suddenly and with greater intensity than do those of ordinary fibromas.

On physical examination, the stony hardness of the tumor and its nodular surface should arouse our suspicion. If, in addition, one can get a crackling sensation on compression of the tumor, or crepitation caused by its friction against the pelvis, the diagnosis becomes positive.

Radiography has so far been very little used, but should be of invaluable aid. The spontaneous expulsion of "womb stones" or their removal by curettage are very rare occurrences. Hallopeau and Raymond (26), while palpating a hard tumor the size of a fœtal head, obtained a crackling sensation which they correctly interpreted as being due to incomplete areas of calcification, allowing the calcified areas to rub against each other. Walther obtained a sensation of friction and crepitation by rubbing the tumor against the promontory of the sacrum, which enabled

him to make a correct diagnosis. It remains a fact, however, that a majority of these cases are correctly diagnosed at the time of operation.

Among the rarer complications to which calcified fibromata may give rise, perforation of the rectum, kinking of the small intestine, perforation of the bladder, occlusion of a ureter leading to fatal hydronephrosis, and compression of the iliac vessels on one side leading to œdema, and even gangrene of a lower extremity, may be mentioned.

Prognosis. As a rule, this is not good. Occurring, as they do, in patients suffering from more or less serious cardiovascular disturbances, the removal of these tumors is a poor surgical risk. Neither does their removal have any beneficial effect on the cardiovascular system, the changes in the heart muscle and vessel walls already being permanent. Nevertheless, the sudden complications which are so apt to occur make immediate operative interference imperative. Pignard (27) analyzed eighty-one cases and found a mortality of 31 per cent.

Treatment. This may be summed up in a few words: abdominal supravaginal hysterectomy with or without drainage, depending on the acuteness of the complications or presence of infection.

CONCLUSIONS

Uterine fibroids may undergo calcareous degeneration, especially the subserous and interstitial varieties. These changes almost invariably occur after the menopause; hence, the grave complications arising from increased weight and displacement of the tumor occur late in life.

It becomes self-evident, therefore, that "the doctrine that the menopause is nature's cure for fibroids is a mischievous tradition."—Giles (28).

The early diagnosis and removal of uterine fibromata, before regressive changes have occurred, will insure the best prognosis and give the lowest operative mortality.

REFERENCES

1. F. Werner. Ztschr. f. Geburtsh. u. Gynäk., 1912, p. 315.
2. I. Ludlow. Cleveland M. J., 1909, p. 398.
3. Ellice McDonald. J. Am. M. Ass., 1904, xliii, 1344; J. Obst. & Gynec. Brit. Emp., 1909, p. 84.
4. Mary Scharlieb. Royal Soc. Med., Obst. & Gynec. Sect., 1908, p. 45.
5. S. E. Tracy. Surg., Gynec. & Obst., 1908, vii, 246.
6. W. B. Dorsett. J. Am. M. Ass., 1911, Dec. 23, p. 2049.
7. C. P. Noble. J. Am. M. Ass., 1906, Dec. 8, p. 1881.
8. J. T. Everett. Am. J. Obst., N. Y., 1879, p. 246.
9. P. Guibé. Thèse de Paris, 1901.
10. A. Bernardie. Thèse de Paris, 1911.
11. P. Nadel. Soc. Anat., Par., 1913, July, p. 347.
12. J. W. Poucher. Tr. Am. Gynec. Ass., 1913, p. 333.
13. A. H. N. Lewers. Tr. Obst. Soc., Lond., xlii, p. 149.
14. M. L. Harris. Tr. Am. Gynec. Soc., 1897, p. 57.
15. Walther. Ann. Soc. de Chir., Par., 1908, p. 698.
16. Péraire. Soc. Anatomique, Paris, 1909, p. 151.
17. Kieffer. La Gynec., Bruxelles, 1909, p. 135.
18. E. C. Dudley. Am. Gyn. and Obst. J., New York, 1897, p. 58.
19. J. M. Withrow. Lancet-Clinic, 1904, p. 35.
20. E. C. Dudley. Textbook of Gynecology, 1913, p. 359.
21. N. S. Thorne. California St. J. M., 1905, p. 332.
22. Cornil. Manuel d'histologie pathologique, 1901, i, p. 97.
23. P. S. Doane. Surg., Gynec. & Obst., 1912, Jan., p. 43.
24. J. A. Sampson. Surg., Gynec. & Obst., 1911, July, p. 98.
25. Lesne and Lagane. Bull. et Mém. Soc. Anat., Par., 1910, p. 747.
26. Hallopeau and Raymond. Soc. Anatomique, Par., 1906, p. 224.
27. Pignard. Quoted by Bernardie.
28. Giles. Lancet, Lond., 1907, p. 653.

TRAUMATIC PAROSTEAL BONE AND CALLUS FORMATION

The So-called Traumatic Ossifying Myositis

By OLIVER J. FAY, M. D., Des Moines, Iowa

IN the years which have elapsed since Copping (1), in 1740, and Freke (2), in 1741, first described bone masses within the muscles, such formations have continued to excite interest. During the succeeding one hundred and fifty years only occasional case reports and dissertations were published,[1] but towards the close of the nineteenth century when the discovery of the X-ray made possible diagnosis without operation, and the enactment of workingmen's compensation laws gave a new importance to all occupational injuries, the number of these publications greatly increased, so that the literature now contains more than five hundred reports of muscle ossification following trauma. Although the multiplicity of reported cases has robbed the subject of its novelty, the interest in its many unsolved problems has not lessened.

The subject also has a very practical application since the number of reported cases is no index to the frequency of the affection. Where ossification is not extensive, where its location is such that it does not seriously interfere with function, the condition often is not brought to the attention of a physician; even when a physician is consulted, failure to employ the X-ray, or to interpret its revelations correctly, frequently results in a mistaken diagnosis; finally, not all cases in which a diagnosis has been made, nor even all of those in which an operation is performed, find their way into the literature. Machol (10), who made a special study of the relation of posterior dislocations of the elbow and their reduction to so-called traumatic ossifying myositis, observed sixteen such dislocations radiographically and found that ossification in some degree followed in each case. From this he concludes that ossification is the usual sequence of uncomplicated reduced dislocations of the elbow. While we may be unwilling to accept such a sweeping statement, there can be no doubt that ossification following such dislocations is far more frequent than has been believed, and that it is a common cause of the unsatisfactory results following reduction.

Traumatic ossification of the muscle is most frequently met with in early adult life and is far more common in males than in females — facts indicative only of the factor which determines ossification i. e., trauma, to which those who lead an active life are most exposed. Ossification following repeated trauma may be classed with the occupational diseases; cavalry men may develop "riding bones," infantry men "exercise bones" in the muscles of the inner thigh and upper arm respectively. In ossification following a single injury, the occupational element also enters in, although it is less obvious: the farrier, the shoemaker, the football player, in short, any one whose vocation or whose avocation brings with it the hazard of trauma, is "predisposed." It has often been remarked that patients with intramuscular bone formation have unusually well-developed musculature, but here, too, we may suppose that it is rather the hazard of the active life led by these people than any real predisposition that is responsible for the ossification; an individual predisposition, comparable perhaps to the tendency to keloid cicatrization or luxuriant callus formation, is not to be excluded.

The occupational element is also clearly seen in the localization of the bone formations: in football players, cavalrymen, shoemakers, farriers in the thigh; in infantry men (following bayonet practice) in the upper arm. Ossifications in the glutei, the recti, the iliac psoas, the pectoralis, the subclavius, the subscapularis, the temporalis, the gastrocnemius, and the thenar muscles have also been reported.

Widely varying theories have been advanced to explain the intramuscular forma-

[1] Otto (3) wrote on this subject in 1816, Kalm (4) in 1830, Miescher (5) in 1836, Schuh (6) in 1854, Billroth (7) in 1855, Weber (8) in 1856, Rokitansky (9) in 1860, etc.

tion of bone following trauma. They may be grouped under four heads: the hæmic theory, the theory of aberrant sesamoid bones, the theory of periosteal origin, the theory of ossifying myositis.

The hæmic theory was first suggested by Sedeler (11), who held that the blood which escaped from the ruptured vessels organized, was transformed into cartilage, then ossified. The theory is histologically so untenable (La Pointe (12) styles it a histological heresy) that it deserves no further discussion and has, in fact, never received much support. The influence of hyperæmia and clotted blood has, on the other hand, been the subject of much experimental work and controversy, and the part which hæmorrhage may play in so-called myositis ossificans traumatica has gradually been incorporated in the other explanations.

The theory of aberrant sesamoid bones, fathered by Bard (13), like the hæmic theory, has found but few defenders. It assumes that under the stimulus of trauma such bones proliferate and assume considerable proportions.

Graf (14) was apparently the first to advance the idea of periosteal detachment in explanation of the origin of bone in masses, while Berndt (15) has vigorously defended the theory of periosteal dissemination. The former assumed that trauma results in the detachment of periosteal flaps which are drawn into the tissues by the contracting muscles, and there proliferate; the latter supposes that the inner osteogenetic layer of the periosteum reacts to the trauma by a proliferation of bone-cells which then force their way through the outer shell, or wander out through a breach, and continue to form bone. Sometimes a more active part is attributed to this cell invasion, and it is asserted that osteoblasts and cartilage cells migrate into the muscles, forming nuclei from which ossification proceeds (true dissemination).

Berthier (16) by experiment demonstrated the possibility of periosteal ossification by chiseling bits of periosteum from the bone and allowing the contracting muscles to draw them into a fleshy bed; but the application of his experiments to the sort of trauma which here comes into consideration is very questionable — severe contusions, sprains, or rupture of the muscle are very different from the action of the chisel. Moreover, the resulting ossifications never grew much larger than the original flaps — in marked contrast to the rapid development of the large masses of bone formed in traumatic ossification of the muscles. Marcus' (17) experiments, in which he attempted to detach the periosteum from the bone by traction on the muscles, were carried out on cadavers. While the difficulty or even the impossibility of detaching the periosteum by traction was demonstrated, here too the conditions cannot be said to reproduce those of trauma. La Pointe (12), however, asserts that the separation of the covering of the bones into two layers — an external adventitious and an internal osteogenetic — is in reality somewhat schematic at the point of insertion of muscles such as the crural, the vasti, and the brachialis anticus, the periosteal connective tissue here mingling with the connective tissue of the muscle to form a single tissue. Even granted that a fissure in the periosteum may have been produced, he holds that Berndt's theory of periosteal dissemination would still be inadequate to account for the ossifying of the entire connective-tissue woof of the traumatized muscle within the very short period of time so often reported; a migration of bone-cells active and rapid enough to infiltrate the entire contused area, in some cases a distance of more than twenty centimeters from the supposed fissure in the adventitious coat, is inconceivable.

König, who obtained his specimen from the cadaver of a woman who died four months after the accident, which resulted in injuries to the spine and head and the development of a bony mass in the thigh, refers to the pushing up of the periosteum by osteofibrous proliferation at the site of the swelling in the thigh, and of an apparent escape of cells into the surrounding tissues. He adds, however, that in numerous experiments on rabbits, he succeeded in producing fibrous thickening of the periosteum, but that he never succeeded in producing any parosteal ossification. Berndt (15), supposing that the mass which developed

in the thigh of a man of 62, who had been kicked by a horse, represented a parosteal callus, operated on the twelfth day after the accident. The muscles showed gelatinous œdema and indurative degeneration, the periosteum was thickened and congested. The mass together with the periosteum and a thin layer of the compacta was removed *en bloc*. On microscopic examination, no trace of beginning ossification could be found and there was no round-celled infiltration. The patient made an uneventful recovery, but six weeks later a second operation was necessary because of limitation of motion and the development of a hard mass at the site of the first operation. Gelatinous œdema and indurative degeneration were again present, but this time a parosteal callus was also found.

One of the arguments most frequently urged against the assumption of a periosteal origin is based upon the development of bone in the free musculature, a stratum of apparently normal muscle separating the growth from the normal bone; since bone may develop independently of the periosteum, it is urged, why have recourse to the theory of periosteal origin to explain any parosteal ossification? Will not the theory which explains the pathogenesis of the free bone mass also answer for the adherent one? The supporters of the theory of periosteal origin have held that all these bone-growths were at first attached to the skeleton, the attachment later being broken or absorbed — an explanation which their opponents have termed "forced."

The latter have quite generally maintained that the ossification was distinctly an inflammatory process as shown by the greater or less degree of round-celled infiltration reported in many cases; the formation of the mass by "organization" rather than by proliferation as shown by its early appearance in practically its ultimate size; and by the acute symptoms sometimes observed. Berndt (15) thinks that this inflammation is due to an infection of hæmatogenous origin, and finds confirmation of this theory in two reports: one published by Itzerott (19) in which a bony mass developed in the upper arm which had become red and swollen without assignable cause, a slight rise in temperature being present at the onset, and one reported by Roskowski (20) in which the entire musculature of the forearm ossified following repeated abscesses.

In this connection it must be remembered that the deposit of bone in such places as lymph-glands, old tuberculous lesions of the lungs, atheromatous ulcers of the aorta, fibromata, etc., is of frequent occurrence, but the process is not necessarily an inflammatory one. Borst (21), discussing the calcification of fibromata,— and what he says is of general application,— states that: "A peculiar kind of calcification which resembles true ossification may come about in the following manner: the fibrous parenchyma over considerable areas sinters together (undergoes hyaline degeneration) and then calcifies *in toto;* it is then separated from the uncalcified tissue in the form of bony trabeculæ, and traversed by canaliculi, the entire arrangement of which may bear a strong resemblance to haversian canals. Closer examination shows that the questionable trabeculæ here and there merge with the neighboring fibrous tissue, and that in spite of the marked resemblance to osseous trabeculæ, not a single true bone-corpuscle is demonstrable in the ossified parts . . . Without doubt, true ossification may also take place in fibromata, and that by a true metaplasia of the tissues; the connective-tissue cells which are enclosed in the ossifying area are transformed into typical bone-corpuscles bearing Sharpey's fibers, while the fibrous basic substance becomes thickened and homogenous, and is finally transformed into true calcified bone matrix; the cells then lie in characteristic toothed bone cavities."

Critical study of the literature on "myositis ossificans" (in many of the reports no detailed microscopical examination is recorded) makes it seem very probable that some of the reports concerned in reality a pseudo-ossification, i. e., bonelike lime deposits containing no true bone-corpuscles, or a secondary ossification following necrosis and the deposit of lime salts (Liek [22], Sacerdotti and Frattin [23]). It is quite conceivable that either of these processes might follow the bacterial invasion of a muscle, or even, as we shall see presently, that bone of the type

met with in parosteal callus might be produced following such an infection. But the typical clinical picture in parosteal callus formation is that of regeneration and not of infectious or any other sort of inflammation, and careful examinations in a long series of cases have given no basis for assuming the presence of infection.

Ewald (24) thinks that because these bone formations always develop in the neighborhood of a joint (?), the determining factor is some component of the latter, probably the synovia. He made experiments on three rabbits, with negative results, but concluded that his failures might be due to the unsuitableness of rabbits for such experiments, since three control rabbits in whom a luxatio cubiti had been reduced without the injection of synovia also failed to develop any ossification. Fabris (25) injected synovia, or synovia and blood, obtained both from animals of the same species and from animals of a different species, into the muscles of five dogs, but obtained no ossification; from this fact, he concluded that the synovia plays no part in determining intramuscular ossification. The formation of bone following "chemical inflammation" (the repeated injection of quinine (Oddi [26]), of iodopin (Mittler [27]), the injection of serum (Bodieau [28]), has been reported in the literature. In the first of these there was the repeated trauma from the injection; in the last a large hæmatoma formed. If inflammation is considered the reaction of irritated and damaged tissues which still retain vitality, we must admit that inflammation is always present following muscle trauma, but if we are to accept the term in its narrower surgical application as synonymous with infection, inflammation is present in but few cases.

During the past ten months, six cases of intramuscular ossification have come under my observation, and the interest they awakened led to a study of the material obtained at operation and to a review of published work regarding the condition. In reporting my observations and discussing the origin and nature of the new-formed bone, I am aware that I am treading upon uncertain ground, for until it has become possible to reproduce these parosteal bone-masses experimentally and with a certain degree of constancy, thus making possible a daily study of their development, any explanation of them must necessarily be more or less hypothetical.

In the nature of the injury, in the symptomatology, and in the radiographic revelations, the cases which came under my obserbations were very typical of the type of bone formation under discussion, and for that reason they seem worthy of a brief review. Neither the family history nor the personal history up to the time of the injury contains anything pertinent to the discussion in any of these cases and I shall, therefore, refer only to the condition which brought the patient to me.

The first of these, referred to me by Dr. T. A. Burcham of Des Moines, was in a muscular, well-developed man of 23, who had been struck on the thigh during a football game. The leg became swollen and numb but was not painful. As the swelling subsided an indurated area was noticed and was treated by rolling massage. Both this massage and deep pressure were painful and the leg could not be flexed. A swelling occupied the middle third of the quadriceps extensor femoris, and in the deeper structures a hard mass, apparently attached to the femur, could be defined. The radiograph (Fig. 1, which unfortunately does not show the entire length of the mass) disclosed a long, spindle-shaped shadow, forked at the upper end, lying parallel to the long axis of the bone and separated from it by a zone of light.

At operation, five weeks after the injury, a bony mass some six and one-half inches in length and two in breadth was found lying in the vastus medius. Sharp dissection was necessary to free the mass from the muscle of which it appeared to form a part. At one point it was also adherent to the femur over a small area, and after it had been pried loose with the chisel the surface of the bone was curetted; recovery was uneventful. When the patient was discharged from the hospital ten days after operation, the leg was still somewhat swollen and motion in the knee was limited, although not enough to interfere with walking. A month after the operation a second X-ray was taken and an indistinct shadow was seen over the femur at the point from which the callus mass had been removed. From that time on, X-rays were taken at frequent intervals (Fig. 2), and it was found that the shadow became denser, its outlines clearer, although it did not increase in volume. The patient, eager to take up athletics again, importuned a second operation, and four months after the first operation, the shadow having remained unchanged for several weeks, a second mass was removed. It

had about the volume of an egg, was encapsulated, adherent to the muscle at one point only but firmly adherent at the site of attachment of the primary mass. Recovery was again rapid and uneventful. The knee gradually regained normal motion and six months after his discharge from the hospital, he was again playing the star role on his football team. A radiograph taken nine months after the operation (Fig. 3) shows a "bone scar."

The masses removed by both operations were submitted to Dr. E. R. Le Count of Chicago who made the following report:

There are two pieces of muscle each containing considerable bone. One is 15.5 cm. long, 5 and 4 cm. in the other dimensions. It tapers at the ends (Fig. 4) from the cutting and dissecting away at the operation of the muscles and fascia from the tissue to which it was adherent. At one place there is an area (a, Fig. 4) 4 by 2.5 cm. in size where the bone in it was chiseled to remove it.

The smaller piece is 8 by 3.8 by 2.5 cm. in size and in a general way corresponds to the larger mass. A relatively larger part of its exterior is formed by bone (Fig. 5).

Histological examinations. Sections were examined from segments cut out of each piece and decalcified (Figs. 4 and 5) and from a number of pieces in each segment. They do not differ markedly. The chief difference is the presence of an old hæmorrhage (Fig. 6) in nearly all the sections examined from the larger mass.

If the microscopic examinations had exhausted the material, and sections had been secured from all parts of each mass, it is likely that much more in the way of evidence of injury would have been found.

The trabeculæ of bone vary in width considerably, some being as wide as 0.5 mm. When the staining with hæmatoxylin and eosin is so apportioned, there is found, even in the heaviest trabeculæ and those which approach nearest to the structure of compact bone, some bluish staining material in the centers of such trabeculæ, remnants of the cartilage in which the bone has grown, remnants which are generally abundant and obviously cartilage, especially so in the smaller and narrower trabeculæ.

It is not possible to trace the way in which this bone has grown in all of its details, because the masses under consideration represent the results of a process of growth which went on for a considerable period, and it is extremely doubtful whether any of the changes now present are quite like those which prevailed at a much earlier period. One feature of especial interest is the conspicuous part played by cartilage in the production of these bony intramuscular parosteal callus growths. Judging by such features as distribution and relation to other structures, its rôle does not differ in any noteworthy details from that which it plays in the endochondral development of bone, or in the formation of the so-called cartilaginous callus of healing fractures.

The presence in some of the sections of a long, straight, or regular margin to the newly-formed bone (d, Fig. 6) suggests naturally that here the periosteum was not so lacerated at the time of injury, but that parts of it remained, membrane-like, embedded in or lying about the region of the hæmorrhage.

The location of the masses of cartilage, both with regard to skeletal muscle bundles and fibers and to the more recently made and older bone, indicates on the whole that cartilage was formed first. This is in accord with the generally accepted ideas regarding stages in callus development (M. B. Schmidt [29]), but it should not be forgotten that the trauma preceding this callus formation may have so lacerated and dislocated the periosteum that it, too, contributed to some of this heterotopic cartilage.

Many sections were examined for evidence that the production of red blood-corpuscles had begun in these new and adventitious marrow-spaces; none was found. For the most part the marrow-spaces contain spindle-shaped cells; in some there are loosely aggregated collections of lymphocytes. Some marrow cavities are large and possess considerable fat, judging by the shape and other features (Fig. 7) of the holes from which the fat has been removed.

In the disappearance of the skeletal muscle as it was gradually grown through by bone, muscle fibers become separated from the main mass and are found as isolated rounded masses of cytoplasm with centrally placed nuclei, many of them 30 to 60μ in diameter; others are much smaller and resemble the multinucleated cells more commonly met with in chronic inflammation.[1]

From the foregoing it is evident that so far as can be determined, the development

[1] Many are quite like those described by Fujinami, Über das histologische Verhalten des quergestreiften Muskels an den Grenzen bösartiger Geschwülste, Virchow's Arch. f. path. Anat., etc., Berl., 1900 (161), 115. See especially Fig. 10, Plate IV.

of bone in these masses of muscular tissue resembles the formation of bone as it takes place in the repair of fractures more closely than it does any other process in which bone is formed. There are many differences in the structures of the cancellous bone, cartilage, etc., in these parosteal masses and the similar tissues in the callus that unites fractured bones when the union is not hindered or complicated by infection, extensive comminution, inadequate coaptation—when, in other words, normal regeneration and repair take place. Perhaps the chief differences are connected with the arrangement of the various components, bone, cartilage, etc., in these intramuscular callus masses, its aimless irregularity as contrasted with the rather definite arrangement in the callus which repairs a fractured bone. Another difference is the relative absence in the masses examined — the parosteal callus growths — of the loosely constructed tissue made up so largely of spindle-shaped cells which early in the process of normal repair of fractured bones constitute so large a part of the provisional callus. This tissue is variously referred to as osteoid tissue, germinal tissue (Keimgewebe), fibrous osteoid tissue, etc. Later in the normal development of callus, this early loose connective tissue, it may be recalled, contains both cartilage and bone; it serves as a matrix in which bone is formed. As already stated, this tissue is relatively scant in these parosteal masses. It is not altogether absent and had the examination been conducted earlier possibly it might have been found more abundant.

The second patient, referred to me by Dr. L. D. Hews of Rockwell City, was a woman of 50, who had received a posterior dislocation of the elbow in an automobile accident some six months before; the dislocation had been reduced almost at once and the arm immobilized in the usual manner, but both extension and flexion had remained limited. On examination, a rather long, slender mass was found in the cubital fossa, pressure upon which raised the forearm. A radiograph demonstrated that both the humerus and the bones of the forearm had clear-cut outlines, while a slender shadow with a light attachment to the ulna, represented the normal position of the brachialis anticus — a typical picture of the most common form of muscle ossification following the reduction of a posterior dislocation of the elbow (Fig. 8).

Some months later the patient was again examined; extension was now about 130 degrees, flexion 80 degrees. In addition to the limited motion, the patient now complained of some pain and of swelling of the forearm and hand. Physical examination and the radiograph showed no appreciable changes (Figs. 9 and 10). Operation was refused.

Dr. A. R. Hackett, physical director at the Iowa State Agricultural College, referred the third patient to me and the case is of especial interest because the history suggests a possible predisposition. The patient, aged 25, is an athlete, and all his injuries were received on the football field. Seven years ago he was struck over the insertion of the right deltoid; the arm was very sore for a month, then gradually improved, but a hard mass has remained. There is now no interference with motion and the arm is not painful. There is a hard mass on the palmar surface of the right middle finger, the result of a bruise, and a similar mass at the base of the fifth metacarpal, the result of another bruise received eighteen months ago. At about the same time, he was struck over the insertion of the left deltoid; soreness persisted for several weeks and a hard mass remains here too, but there is no disability.

Radiographs of the right arm and of the right and left hand are entirely negative, but a radiograph of the left arm shows a shadow just external to the insertion of the deltoid, apparently representing a bone formation or parosteal callus at the external attachment of the brachialis anticus. Its boundaries are hazy, as if there were no sharp dividing line between parosteal callus and muscle. At its proximal end the callus formation merges with the humerus. The diagnosis of parosteal callus may perhaps be questioned in this case because of the spur shape and the absence of a zone of light between bone shaft and callus formation, but the clinical history is that of a parosteal callus and the close union with the humerus is readily accounted for by the age of the process — we have only to recall La Pointe's description of the attachment of the muscle to the periosteum in order to understand this fusion. Operation was not advised.

The fourth patient, a blacksmith of powerful musculature, was referred by Dr. R. G. Anspach of Colfax. In an attempt to stop a runaway team two months before, this blacksmith had thrown his entire weight upon his left foot while the leg was flexed, and had felt something "give way" in the muscles of the anterior thigh. The thigh was swollen and painful for a few days; these objective symptoms soon subsided but the soreness persisted and the patient was unable to flex his leg. There had been no ecchymosis at the site of the swelling but after a few days an ecchymosis developed in the popliteal space. Three weeks after the accident, the attending physician noticed an induration in the muscles of the anterior thigh, which has grown more marked but has not increased in size. On examination a mass some five inches long and three inches broad was palpated in the middle third of the quad-

riceps extensor femoris, apparently attached to the underlying bone. The X-ray revealed a shadow like a cloud of smoke lying above the femur (Fig. 11). At operation a shell-shaped callus was found in the vastus medius; it was loosened from the muscle by blunt dissection and from the femur, to which it was adherent only at the lower pole, by prying. The inner surface of the callus mass was concave, fitting over the convex surface of the femur, and this saddling of the bone accounts for the absence of the zone of light between femur shaft and callus formation. Recovery was rapid and uneventful and his physician reports an excellent functional result.

This specimen was also sent to Dr. Le Count, whose report follows: The largest dimensions of the tissue are 11.5, 5.0 and 2.8 cm. For the most part it is covered with muscle. It is very firm and contains a shell-shaped mass of bone, so that one surface is cupped, the depression of 1 cm. in its greatest depth being 8 cm. long and 3 cm. wide.

Corresponding to this, the opposite surface is convex and on it (Figs. 12 and 13) are the only suggestions of bone seen anywhere on the outside, bluish-gray smooth patches resembling cartilage.

Histological examination. Sections were studied from a number of places from two segments removed at points indicated in Fig. 12 and in a general way the conditions are not materially different in the various places examined, nor do they vary much from those previously reported. In some places there is more bone than in others; in some the cartilage is relatively more abundant. Regions of old hæmorrhage are present (Fig. 14), separated from the bone by a dense wall of fibrous tissue. The bone is usually heavier close to the enveloping fibrous tissue (Fig. 15). In sections from one portion (Fig. 16) conditions occur very much like those in an epiphyseo-diaphyseal junction, like those illustrated for the "burrowing capillaries" described in textbooks in the accounts of the transformation of the epiphyseal cartilages into bone as it occurs normally.

A relationship between the bone and muscle much more intimate than any previously seen was found in some of the sections (Fig. 17); as in those previously examined the absence of any inflammatory changes constituted one of the most noteworthy characteristics; there is not in any of the microscopic preparations any foundation for the use of the name "myositis."

The fifth patient, a well-developed lad of sixteen, had suffered a forward dislocation of the elbow seven weeks before. There was considerable deformity and motion was limited. The radiograph, in addition to the displacement of the bones, showed a faint shadow in the cubital fossa (Fig. 18). During an open operation for the reduction of the dislocation, a callus mass one and one-half inches long was removed from the border of the brachialis anticus into which it extended. It was lightly attached to the ulna. Recovery was uneventful and the patient had a range of motion of six inches a few weeks after operation. The callus mass was sent to Dr. Le Count whose report is given below:

This piece of tissue is 4.5 cm. long and from 2.2 to 0.8 cm. in the other dimensions. It resembles the terminal two phalanges of a somewhat mutilated finger. One end of it, corresponding to the tip of the finger, is quite pointed. The other is almost entirely made up of bone and is an irregularly rounded surface 1 to 1.5 cm. in diameter. The outside of this has attached to it numerous small shreds of muscle and in some places shreds of tendon.

Histological examination. The structure of this bone is much more dense (Fig. 19) than any previously examined and the trabeculæ contain very little cartilage, the marrow spaces little else but adipose tissue.

The sixth patient was a farmer of 30. Twenty-two years ago he was kicked on the right elbow by a calf. The arm, which was swollen and painful for a time, gradually returned to normal. Since then, however, on any unusual exertion of the arm, the elbow has become swollen and tender. Two days before he consulted me he had helped put chains on an automobile and had since had constant pain in the elbow and forearm. Passive motion now gave him pain in the elbow and forearm; the joint was tender and a small bony mass was palpable in the cutibal fossa. The radiograph (Fig. 20) revealed a small round shadow here, apparently in the brachialis anticus near its ulnar attachment. Operation has not yet been performed.

In the constant factor of trauma, in the presence of disappearing hæmorrhages, in the formation of bone by the endochondral route, it is easy to recognize the likeness between this intramuscular callus and the callus developed following a fracture, and if these four specimens were considered alone, without reference to other reports, it would seem not difficult to accept for them a periosteal origin — an outpouring of bone-cells through the contused or lacerated periosteum and their growing into and through the overlying tissues, gradually replacing the clotted blood and perhaps necrotic tissue. The intramuscular callus would thus become only another variety of periosteal callus — a periosteal callus developed in the tissues above an imperceptible fracture of the periosteum. With this conception of its origin, inter- and intramuscular connective tissue would play but a subordinate part, if any rôle be accorded it, bearing essentially the same relationship to the ossification as to the callus of fractured bone.

Cahier (30) says that, contrary to the com-

monly accepted belief, the number of traumatic bone formations in the free musculature is to the number of those attached to the bone as three to two, and with these statistics the question of periosteal origin assumes a different aspect, for it is difficult to account for the absorption of the periosteal attachment in three-fifths of all reported cases. The theory of periosteal dissemination, of periosteal flap

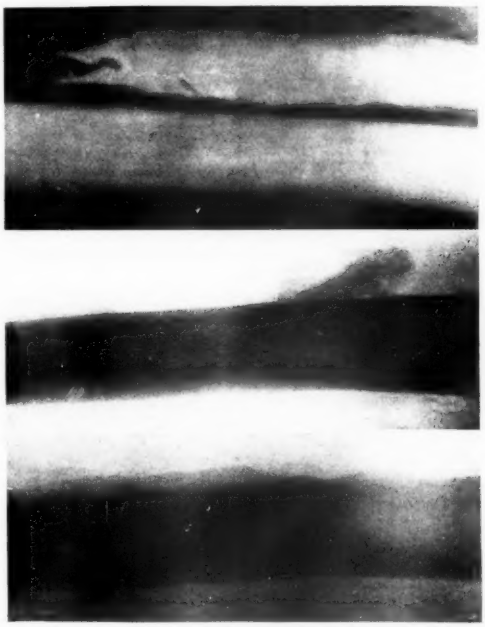


Fig. 1. Case 1 before operation (the entire length of the mass is not shown). The zone of light between callus formation and bone shaft is well defined.

Fig. 2. Case 1 three months after operation. The shadow has assumed definite outlines.

Fig. 3. Case 1 eight months after operation. There is a well-developed "bone scar" but no impairment of function.

detachment, of ossifying myositis in the sense of an inflammatory process due to an infection or a chemical irritant, are alike unconvincing, while, on the other hand, the marked resemblance to the callus of fractures suggests a reparative process.

This brings us to the question of nomenclature. The term "myosteoma" so frequently employed by French writers is not applicable,

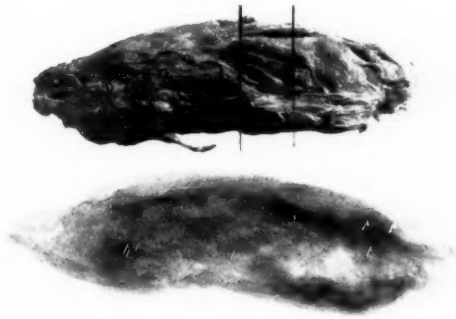


Fig. 4. Reproduced photograph and radiograph of the mass removed (Case 1) at the first operation. Reduced to two-fifths. The irregular area indicated by "a" is where on the side opposite to that shown here this mass has bone on its exterior, a surface made by sawing it away from the femur. The parallel lines are where material was removed for histological examination.

or at best it is misleading, since the suffix *oma* is so commonly taken to signify true tumor formation, and these callus growths differ essentially from a neoplasm in the narrower interpretation of that word, while with a broader construction of the term, the appellation *myosteoma* becomes a loose expression

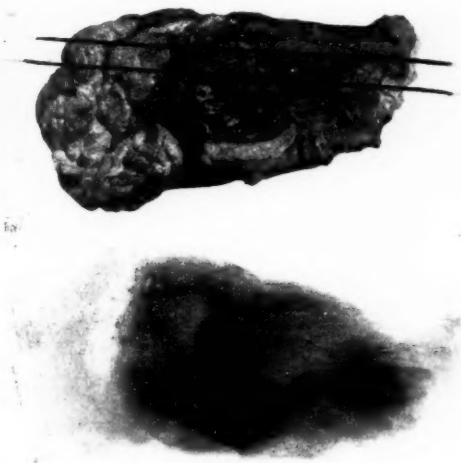


Fig. 5. Mass removed at the second operation (Case 1) with radiograph. The irregular region indicated by "a" is a surface made by chiseling this mass away from the femur. The parallel lines indicate the piece removed for microscopic examination.

applicable to many different conditions. Nor does the term myositis ossificans traumatica seem a happy choice, for although it takes account of the factor of trauma, it lays emphasis upon the inflammatory instead of upon the reparative nature of the process. Because of the essential part played by trauma, the marked similarity in structure to the structure of the callus of fractured bone, and the impression gained of a regenerative process, I prefer the term *parosteal callus*, the modifier *parosteal* (from Greek παρά amiss + ὀστέου bone) distinguishing it from the callus of fracture formed in and about the broken bone.

The question of the possible significance of metaplasia in the production of these parosteal growths has purposely been left for separate discussion. Borst (21), in speaking of the former over-readiness of the scientist to accept a return of the cell to the embryonal type, remarks that this view is no longer accepted, and that we are now inclined to hold all too firmly to the absolute fixity of cell type. He continues: "Examples enough of a transitory or a permanent loss of differentiation may be found in inflammatory, regenerative, atrophic processes. Such observations have also been made upon the basis of experimental studies (tissue transplantation). Placed under other conditions, with a changed nutrition, a changed relationship to the nerves, a lack of functional demands, in short — if I may be allowed the expression — with a change of their entire *milieu*, the cells and tissues change their morphological characteristics and also no longer exhibit certain specific functions. But the morphological change does not by any means indicate to us that the nature of the cell has also changed, and the failure of certain specific functions to manifest themselves does not demonstrate that the cells have entirely lost these qualities; on the contrary, not infrequently with the advent of normal conditions the original form as well as the specific function is restored."

The action of trauma upon the tissues would seem quite capable of producing a change of the entire environment of the cell, for not only is a changed nutrition brought about but in most cases there is also temporary suspension of function. As a result we have a reparative process with a temporary loss of cell differentiation resulting in the formation of an intramuscular callus. "With the return of normal conditions, the original form as well as the specific function is restored" and the growth of the parosteal callus is thus limited by the restoration of approximately the old environment. But metaplastic bone is true bone and is no more readily absorbed than is the latter; with the gradual return of the surrounding tissues to normal, the parosteal callus, surrounded by a fibrous capsule,—a periosteal covering, we may say,—is left within the muscles as an "osteoma" or attached to the underlying bone as an "exostosis."

This distinct limitation of the period of growth draws a sharp line between parosteal callus and tumor growth (Cahier terms the former a *paraplasm*) and has long been emphasized in determining the proper time for operation. In the clinical picture, the tense doughy mass palpated in the first few days after the receipt of the injury represents the blood infiltrated tissues, sometimes also a considerable hæmorrhage; later the mass loses its elasticity and becomes more distinctly indurated, finally attaining a bonelike consistency as cartilaginous bone replaces the blood-clot. The fact that the mass has its ultimate size almost from the first has often been urged in support of the theory of periosteal flap detachment and intramuscular transposition. The detachment and dislocation of such a large flap is scarcely conceivable, while the clinical picture accords well with the conception of a morbid indurative reparative process.

But are the histological findings compatible with our conceptions of connective-tissue metaplasia? May metaplastic bone pass through a chondral stage? Such an endochondral origin has generally been held to be characteristic of periosteal bone formation, but recent repeated microscopic examinations of various forms of ossification would seem to make such a dividing line between metaplastic and periosteal bone untenable. Reports of bone formations in the abdominal muscles have been referred to and the possi-

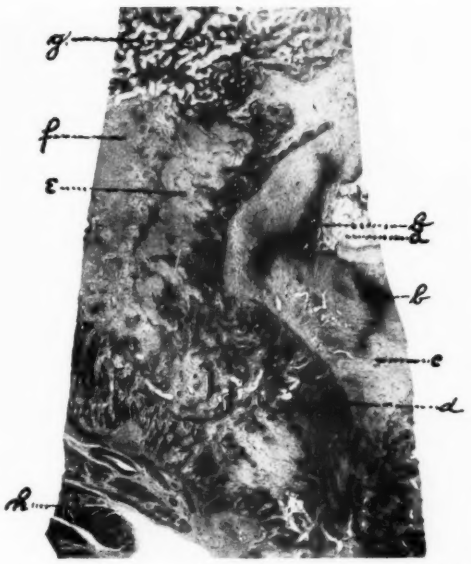


Fig. 6. Photomicrographic reproduction of a single section. The section is 2 cm. long, 7.5 mm. wide at the narrow, 12 mm. wide at the opposite end. Here the zones are well shown. Starting with the old blood clot (a) as a center, there are (b) places where hæmorrhage is still present in the zone of granulation tissue (c); outside of these zones a zone of bone (d) sharply demarked on the one edge but uniting very irregularly with the next outermost zone of cartilage (e); (f) osteoid tissue; (g) spongy bone; (h) skeletal muscle.

Fig. 7. An unusually large marrow cavity with many places (round holes) where fat formerly was present. Here bone formation is relatively quiescent although nearly all the trabeculæ contain cartilage. 30 Dia.

bility of confusion with the pseudo-ossification described by Borst has been pointed out. Detailed microscopic examinations of some of the specimens are, however, given and the presence of true bone cannot be questioned. In some of these descriptions the presence of cartilage is specifically mentioned (Röpke [31], Chapelle [32], Sabijiakina [33], Strassberg [34]), while in other cases the specimen was removed at a time when the formative period was past, and it was, therefore, impossible to determine whether bone was formed in a chondral matrix. The presence of cartilage in an ossification of the gluteal muscles is reported by Tubenthal (35).

König (18), whose specimen showed bone formed both directly and by the endochondral route, considers the possibility of all the tissues surrounding the bone sharing in the formation of the callus. Frangenheim (36), who made a painstaking study of an attached parosteal callus and of numerous ossifying foci distributed throughout the overlying vasti muscles, thinks that only the shell of the attached callus, i. e., the part immediately overlying the bone, is of periosteal origin while the remainder of this mass and the scattered foci of ossification are developed at the expense of the intramuscular connective tissue — such development in the case of the intramuscular foci being clearly demonstrable. Orth (37) reports the case of a man of 84 who developed a luxurious callus following a fracture of the femur. The man died a fortnight after the accident and Orth made a careful study of the callus. No internal callus had been formed and a great deal of blood was present in the medulla; the mass consisted of much cartilage and osteoid tissue, with here and there finished bone; callus was present everywhere between the muscle fibers and in part between the muscles. It was possible

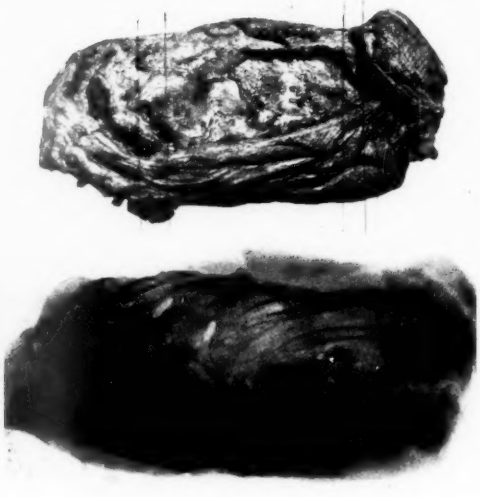
Fig. 8. Case 2 six months after reduction of the posterior dislocation.

Fig. 9. Case 2 six months later showing the extent of flexion.

Fig. 10. Case 2. Limited extension.

to section the material without decalcifying it, thus greatly facilitating the examination. Orth states that while no one now believes in the metaplastic production of epithelium from connective tissue, connective substances — particularly connective tissue, cartilage, and bone—may merge with each other. He distinguished between cell-metaplasia and tissue metaplasia: in the former the connective-tissue cells take on an osteoblastic function, forming bone exactly as do the osteoblasts of the periosteum; in the latter, bone is formed directly from connective-tissue fibers. He believes that the callus in this case was formed from intramuscular connective tissue by tissue metaplasia and, therefore, was not of periosteal origin. In connection with this description of Orth's it is interesting to recall that in many of the reports of parosteal callus,

Fig. 11. Case 4. The saddling of the femur by the callus formation prevents an unobstructed view of their relation to each other and, consequently, the zone of light between them is not clearly defined. The "cloud of smoke" appearance is typical.



Figs. 12 and 13. Photograph and radiograph of tissue removed from the fourth patient. Segments taken for microscopic examination indicated by the parallel lines.

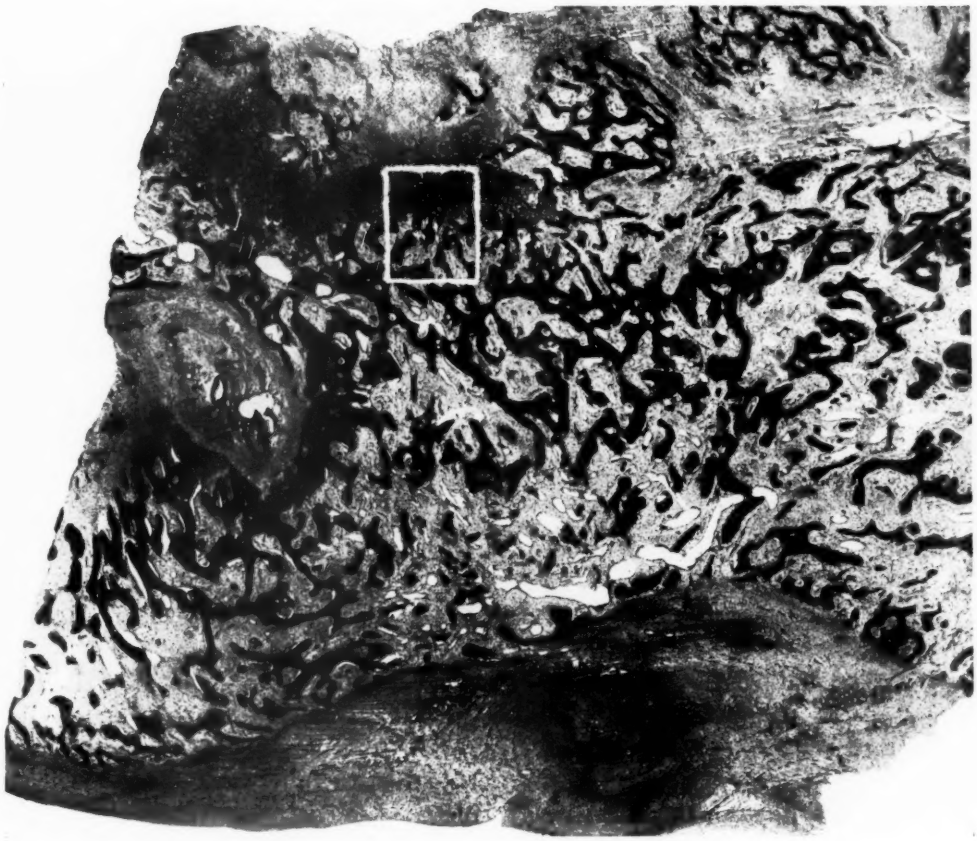


Fig. 14. Bone with an old hæmorrhage in the adjacent tissue (below). Above where the square is drawn there is hyaline cartilage. This field enlarged is shown in Fig. 16.

especial mention is made of the formation of bone by the direct and by the endochondral route proceeding side by side.

I shall not attempt to determine the respective part played by periosteum and by intramuscular connective tissue in the production of adherent parosteal callus. The conception of ossification proceeding simultaneously from periosteum and from intramuscular connective tissue (Frangenheim [36], König [18]) would seem to have much in its favor, the relative importance of each varying widely under different conditions. It is, moreover, quite conceivable that the metaplastic process, extending to the periosteum, would undergo a more or less firm fusion with it, or, again, that now the periosteum and now the intramuscular connective tissue is involved, for with the infinite variations of trauma it is impossible to judge of the exact nature of the injuries to the tissues and to the bone in any given case. Even the origin of the callus of fractures is not uncontested. Macewen (38) and Wetherill (39) hold that the periosteum has a protecting and limiting rather than an osteogenetic function, and offer experimental and clinical evidence in support of their contention. Ryerson (40) also attacks the theory of periosteal osteogenesis and offers radiographic

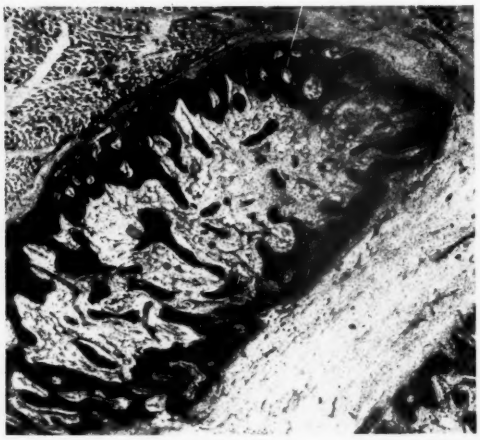


Fig. 15. Small island of bone, illustrating the heavier bony trabeculæ about the periphery. Muscle on one side, fibrous wall on the other.

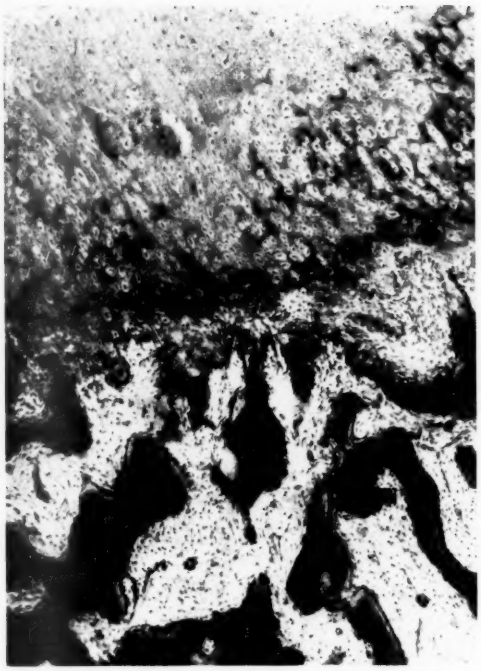


Fig. 16. Reproduction of the junction of cartilage and bone marked in Fig. 14 with appearances very like an epiphyseal line.

evidence in defense of his position: if new bone were formed from the periosteum, the osteoperiosteal angle should be the first to show new bone formation when the periosteum has been stripped up; his radiographs demonstrated that this angle was in fact the last place to exhibit the shadow of new bone formation.

The clinical picture immediately following the trauma which determines a parosteal callus is that of any severe contusion: there is, as a rule, considerable swelling, marked induration owing to the subfacial extravasation of blood and to infiltration of the muscles, absorption thus being retarded, more or less complete loss of function, and sometimes severe pain on pressure. Under treatment these symptoms grow less marked, but the functional does not keep pace with the objective improvement, and the doughy mass representing an extravasation of blood is found to be indurated — sometimes as a whole, sometimes in scattered, circumscribed areas. The impairment of function continues to increase for some weeks, and the induration becomes more marked until it is of bony hardness.

Where ossification follows dislocation of the elbow or the reduction of such a dislocation, it is often not clinically manifest during the first few weeks (Machol [10], four to six weeks); then there is progressive loss of function and increase in the size of the mass in the cubital fossa for approximately the same period of time, the impairment of function being most marked after some three months. In ossification following other injuries, the symptoms make their appearance much earlier — often very soon after the determining trauma. Where ossification follows repeated trauma (occupational trauma), the onset may not be marked by these acute symptoms, but lessened motion or pain on attempting to perform the accustomed duties — mounting, bayonet practice, etc.— may first call attention to the lesion. Rarely a nerve is involved in the callus, causing spontaneous, neuralgic pain, or a blood-vessel, producing œdema.

The history of trauma, together with the clinical picture and physical examination,

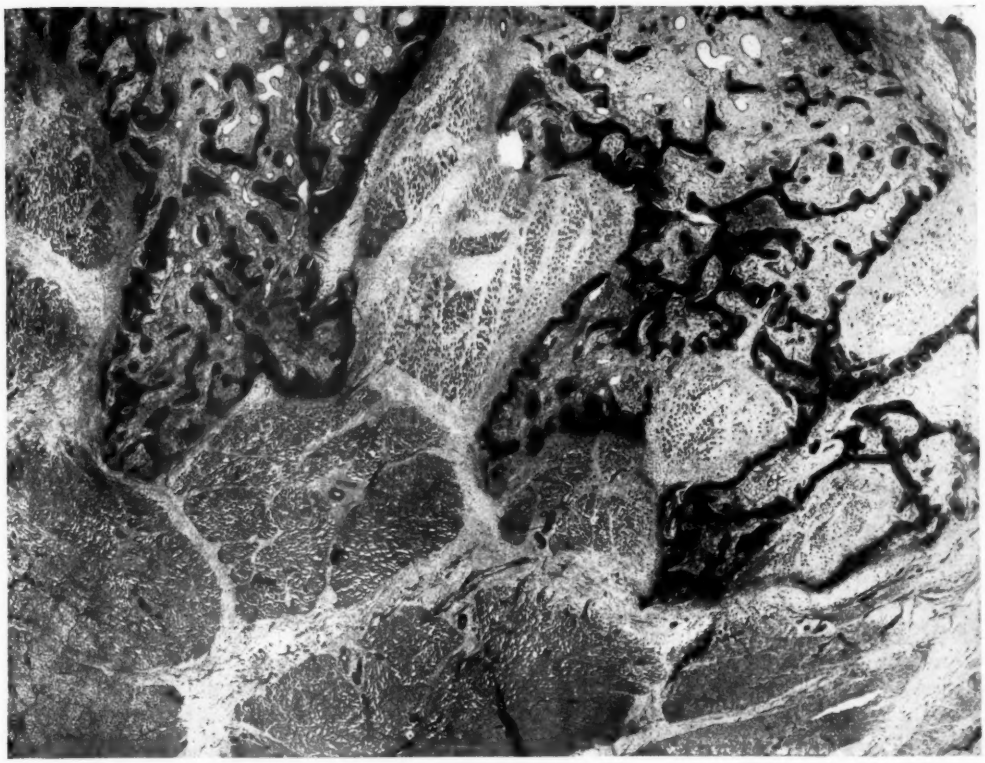


Fig. 17. Showing the intimate relation of muscle and bone.

makes a tentative diagnosis possible, but radiography is our chief aid in differential diagnosis. Kienböck (41), who made a painstaking study of the anatomicopathological changes in "traumatic intermuscular osteoma" as revealed by the X-ray, has given us perhaps the best review of this subject. In the third or fourth week after the injury the parosteal callus first becomes apparent on the radiograph as a faint, indistinct shadow focus, separated from the diaphysis by a zone of light, now wider, now narrower (Fig. 1). This bright line seems to be very constant except where the callus is concave, saddling the bone and obstructing the view of its relation to the skeleton. The shadow is, as a rule, long and slender, very rarely broad, and runs parallel to the long axis of the bone. In parosteal callus developing in the brachialis anticus following the reduction of a posterior dislocation of the elbow, a rounded shadow may lie free in the muscle in the cubital fossa; frequently it is attached to the coronoid process and then usually appears as a triangle or as a club, the apex of the triangle or the handle of the club attached to the ulna. Very often the superior pole of the parosteal callus in the upper arm or the thigh terminates in two prongs.

Kienböck states that in this early stage the shadow cast is by no means homogenous, but consists of numerous light shadow foci compressed into one region, the superficial foci appearing darker than the deeper ones. Sometimes these foci may represent isolated areas of ossification but in most cases they will be found to be parts of one mass, the darker areas being of earlier formation or less

Fig. 18. Case 5. Anterior dislocation of the elbow seven weeks after receipt of the injury. The shadow in the cubital fossa represents a callus formation in the border of the brachialis anticus.

porous. For several weeks the picture continues to change — the shadow grows darker and more homogenous; it shows figuration, stripes and spots, the latter being in turn shaded by the formation of lamellæ which are in part arranged parallel to each other. After from four to six weeks the volume of the mass as revealed by the radiograph corresponds closely to the palpable mass, and it is probable that once this point has been reached no further appreciable changes occur. Radiographs taken six weeks, twelve weeks, and five years after the accident have given the same picture.

While an area of light within the shadow may signify a cyst, it may also represent an area of connective tissue or of cartilage. In the same way the zone of light between the callus and the diaphysis, to which reference has been made, does not necessarily indicate that the callus is free within the musculature; it may have a large or a small pedicle of spongy bone. A broad zone of light does, however, signify the absence of such an attachment.

Under favorable conditions the fine inner markings are an index to the structure of the mass, showing its trabecular arrangement. The strokes of the shading are sometimes parallel to the muscle bundles or to the direction of striping, corresponding to the ossification of muscle bundles or to the deposit of bone lamellæ in the shell-shaped fascia layers.

From the standpoint of differential diagnosis, osteosarcoma, displaced bone fragments, and exostoses are to be considered. Myositis ossificans progressiva and syphilis of the muscles with ossification are usually readily distinguished from parosteal callus because the course of the two former is chronic, often extending over many years. While sarcoma and parosteal callus often have a history of trauma in common, the use of the radiograph should permit of correct diagnosis — in parosteal callus the shaft of the bone is intact, the new-formed bone separated from it by a line of light; in sarcoma these distinct lines are lacking. The same clear-cut diaphyseal line differentiates parosteal callus from a proliferating bone fragment which has been carried into the muscle. Exostoses are often bilateral or multiple, and are most frequently met with where the bone lies near the surface. They have their origin near the epiphyseal line, but may travel upward with the growth of the bone and thus be found on the diaphysis at some distance from this line. In these exostoses the periosteum is pushed out and bone shaft and exostosis appear as one. At operation the impression gained from the radiograph is confirmed, while a parosteal callus usually may be detached from the bone by a rocking or a prying motion. Occasionally a patient with an exostosis gives a history of trauma, but the relationship is incidental, not causal, the injury having attracted the patient's attention to the presence of the bone mass. Subperiosteal exostoses of traumatic origin are also reported (Honsell [42], Schuler [43]), and it is probable that the osseous masses which sometimes recur after the removal of a parosteal callus are in some cases exostoses or "bone scars" rather than recurrent parosteal callus formations. Cartilaginous exostoses are often multiple; the location both as regards the bone affected and the aspect of the bone differs from that of a parosteal callus. Cartilaginous exostoses merge with the bone outlines or rather encroach upon them.

Is there such a thing as preventive therapy in parosteal callus? Since it is not possible in any given case to determine whether there is likelihood of such callus development,—and the number of such callus formation is in-

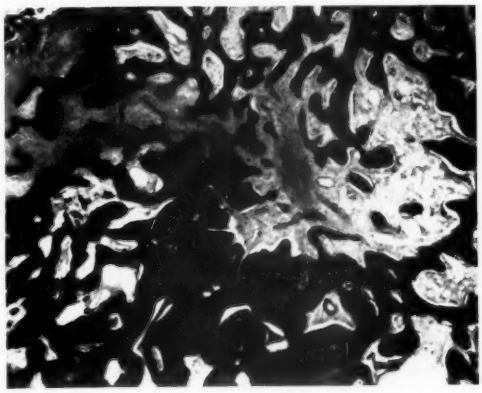


Fig. 19. Very heavy bony trabeculæ and small marrow cavities.

Fig. 20. Case 6. A parosteal callus in the brachialis anticus twenty-two years after the receipt of the determining injury.

finitesimal compared to the number of injuries which might determine them,—it would seem wisest to apply the best treatment for the injury itself. But in reducing any dislocation, the possibility of the development of parosteal callus is an added reason for the greatest possible gentleness to be exercised.

There has been much discussion regarding the indications for operation; but after all, this phase of the subject is a simple one. The period of growth is self-limited, the presence of the callus is in itself no menace to the life or health of the patient; the need of operation is, therefore, determined by the degree of functional disturbance. When the callus is so situated that it interferes with the normal motions of the member (and this is frequently the case when it is situated in the brachialis anticus or the quadriceps extensor femoris) so as to seriously interfere with the accustomed employments, operation is indicated. Where a nerve is involved in the callus (usually the median or the musculospiral in callus formations in the plica cubiti), or where there is interference with the blood supply, operation is, of course, also necessary. Periarticular ossification is a serious complication and here the prognosis is not a good one. Where the callus mass is free within the muscles, good functional results may be expected even where ossification has been extensive, for at worst a fibrous cicatrix gives better service than does osseous tissue. Where the callus is adherent to the shaft of the bone, the outlook is hardly less bright.

The time for operation has also been much discussed, but in answering this question we may again have recourse to radiography. The agreement in size of the radiographic image with the palpable mass, the clear dark outlines of the shadow indicate that the process is at a standstill, and after operation at this period there should be no ossification of the surrounding tissues. Too early operation, before the injured tissues have regained their differential function, and the denudation of the bone (resulting according to La Pointe in a circumscribed proliferative osteitis) are the causes of recurrence of the callus or the formation of an exostosis. A slight proliferation, a bone scar, usually develops after the removal of an adherent parosteal callus, but such a scar is in no sense of the word a recurrence. In early operations it is necessary to remove the neighboring diseased tissues, but if the ripening of the callus is awaited, the operation can be conservative, giving promise of the best functional results.

I wish to gratefully acknowledge my indebtedness to assistant, Miss Giulia Hossfeld, for the help I have received especially in reviewing the literature and editing my work, and to Dr. E. R. Le Count for his excellent histological descriptions and his many invaluable suggestions.

BIBLIOGRAPHY

(Only such publications as are of special historic interest or to which specific reference has been made are listed here.)

1. Copping, J. Philos. Tr., 1740 (cited by Machol).
2. Freke, J. Philos. Tr., 1741 (cited by Machol).
3. Otto, A. W. Seltene Beobachtungen zur Anatomie, Physiologie, und Pathologie gehörig. Breslau, 1816.
4. Kuhn. Beschreibung einer pathologischen Knochenbildung zwischen den Weichtheilen des Oberarms. J. d. Chir. u. Augenh., 1830, xiv, 142.
5. Miescher, F. De Inflammatione ossium eorumque anatome generali. Berlin, 1836, p. 46.
6. Schuh, Franz. Pathologie und Therapie der Pseudoplasmen. Vienna, 1854, p. 147.
7. Billroth, T. Über den Reiterknochen. Deutsche Klin., 1855, vii, 301.
8. Weber, C. O. Die Knochengeschwülste. Abt. I: Die Exostosen und Endochondrome. 1856, p. 43.
9. Rokitansky, C. Pathologische Anatomie. Vienna, 1856, ii, 72.
10. Machol, A. Die Luxatio Cubiti Posterior und ihr Verhältniss zur sogenannten Myositis ossificans traumatica. Beitr. z. klin. Chir., 1908, lvi, 775.
11. Seydeler. Schleifsteinexudate der Recruten. Deutsch. militär-ärztl. Ztschr., 1879, viii, 33.
12. La Pointe, A. Pathogénie et traitément des myostéomes traumatiques. Rev. de Chir., 1912, xlvi, 657.
13. Bard. Man. d'anat., p. 317 (cited by Cahier.)
14. Graf, E. Die königliche Reserve Lazarethe zu Düsseldorf während des Krieges 1870–1871. Elberfeld, 1872, p. 64.
15. Berndt, F. Zur Frage der Betheilung des Periosts bei der Muskelverknöcherung. Arch. f. klin. Chir., 1902, lxv, 235; also, Über Muskelverknöcherung nach einmaligem Trauma. Arch. f. klin. Chir., 1906, lxxix, 617.
16. Berthier, A. Étude histologique et expérimentale des ostéomes musculaires. Arch. de méd. expér. et d'anat. path., 1894, vi, 601.
17. De Lorme. Sur les ostéomes, en particulier sur les ostéomes du cavalier. Bull. et mem. Soc. de chir. Par., 1894, xx, 540.
18. König, F. Über traumatische Osteome, frakturlose Callusgeschwülste. Arch. f. klin. Chir., 1906, lxxx, 64.
19. Itzerott, R. Beiträge zur sogenannten Myositis ossificans. Inaug. Diss., Leipzig, 1903.
20. Roskowski, W. Entzündungen bei Syringomyelie. Halle a. S., 1903.
21. Borst, M. Die Lehre von den Geschwülsten. Wiesbaden, 1902, p. 106, 17.
22. Liek, E. Experimenteller Beitrag zur Frage der heteroplastischen Knochenbildung. Arch. f. klin. Chir., 1906, lxxx, 279.
23. Sacerdotti, C., and Frattin, G. Über die heteroplastische Knochenbildung. Virchow's Arch. f. path. Anat., etc., 1902, clxviii, 431.
24. Ewald, P. Zur Etiologie der Myositis ossificans traumatica. Zentralbl. f. Chir., 1911, xxxvii, 771.
25. Fabris, U. Sulla genesi della miosite ossificante. Gazz. d. osp., Milan, 1911, xxxii, 443.
26. Oddone, O. Della miosite ossificante da trauma chimico. Gior. di med. milit., 1912, lx, 276.
27. Mittler. Verhandl. d. k. k. Gesellsch. der Ärzte in Wien. Wien. klin. Wchnschr., 1903, xvi, 391.
28. Dodieu. Myostéome developpé à la suite d'un hématome diffus intra-musculaire sans traumatisme violent après une injection de sérum. Bull. méd. de l'Algérie, 1913, xxiv, 373.
29. Schmidt, M. B. Der Bewegungsapparat, Aschoff's Pathalogische Anatomie, 2nd edition, Jena, 1911, ii, p. 217.
30. Cahier, L. Sur les myostéomes traumatiques. Rev. de Chir., 1904, xxix, 356; 602; 768; 827.
31. Röpke. Zur Kenntniss der Myositis ossificans traumatica. Arch. f. klin. Chir., 1907, lxxxii, 81.
32. Capelle, W. Ossification dans une cicatrice de laparotomie. Beitr. z. klin. Chir., 1911, lxxiii, 776.
33. Sabijakina, P. L. Knochenbildung in einer Laparotomienarbe. Russk. Vrach, 1910, ix, No. 32. (Cited by W. Hannes, Knochenbildung in der Laparotomienarbe, Zentralbl. f. Gynäk., 1911, xxxv, 1052.)
34. Strassberg, M. Über heterotope Knochenbildungen in der Haut, Virchow's Arch. f. path. Anat., etc., Berl., 1911, cciii, 131.
35. Tubenthal. Myositis ossificans oder Osteosarcom? Deutsch. militär-ärtzl. Ztschr., 1902, xxxi, 479.
36. Frangenheim, P.: Über die Beziehung zwischen der Myositis ossificans und dem Callus bei Frakturen. Arch. f. klin. Chir., 1905, lxxx, 445; also, Die Myositis ossificans im M. brachialis nach Ellbogenluxationen, ihre Diagnose und Behandlung. Deutsche med. Wchnschr., 1908, xxxix, 407.
37. Orth, J. Ein Beitrag zur Kenntniss des Knochencallus. Berl. klin. Wchnschr., 1906, xliii, 430.
38. Macewen, W. The Growth of Bone. Glasgow, 1912.
39. Wetherill, H. The Growth, the Death, and the Regeneration of Bone. J. Am. M. Ass., 1913, lx.
40. Ryerson, E. Clinical Aspects of the Regeneration of Bone as Manifested by a Study of the Union of Frac. Canad. M. A. J., 1913, iii, 865.
41. Kienböck, R. Zur radiographischen Anatomie und Klinik des traumatischen intramuskulären Osteoms. Wien. klin. Rundschau, 1903, xvii, 845.
42. Honsell. Über traumatische Exostosen. Beitr. z. klin. Chir., 1898, xxii, 277.
43. Schuler, H. Über traumatische Exostosen. Beitr. z. klin. Chir., 1902, xxxiii, 556.

INFRACTION OF THE SECOND METATARSAL BONE[1]

A Typical Injury

By ALBERT H. FREIBERG, M. D., F. A. C. S., Cincinnati, Ohio

As a part of the general symptom-complex of weak or so-called "flat" foot we very commonly encounter pain in the forefoot, in the region of the metatarsal heads. When seen as a paroxysmal affection concerning the fourth metatarsal, in particular, we are dealing with the metatarsalgia of Morton. Very frequently, however, we are consulted by patients because of pain in the heads of the other metatarsals which is not of paroxysmal character but rather dependent upon the use of the foot in weight-bearing. This may or may not be in the presence of other signs of yielding and strain in the foot mechanism elsewhere than in the metatarsal region, but the dependence of the pain purely upon the weight-bearing function will cause us to ascribe the symptom to static incompetence of the foot. Under these circumstances we shall find that the most common seat of the pain is the second metatarsophalangeal joint instead of the fourth, as in Morton's disease. The joint is usually tender to pressure and frequently somewhat thickened. The well-known plantar callus is frequently seen; almost uniformly so in cases of long standing. I have often found thickening of such degree in the second metatarsophalangeal joint that I have sought for organic change in the radiogram; always without finding it, however, until I encountered Case 1 of the series which I am now reporting. In this case I felt justified in the diagnosis of infraction of the distal end of the second metatarsal, a condition which I have thus far failed to find described in the literature.

During the past few years I have encountered six cases of infraction of the distal end of the second metatarsal bone. I feel justified in speaking of it as a typical injury because in each of my six cases not only was the same bone end involved, but the conditions under which the patients presented themselves were very similar, as was also the character of the trauma which produced the lesion.

Ten years ago the first patient in whom I recognized this lesion was referred to me by Dr. E. W. Mitchell, of Cincinnati. The patient was a girl of sixteen. She had been suffering from pain in the ball of the foot for about six months. The pain was precisely like that which we so often encounter in the metatarsophalangeal region in connection with static incompetence of the foot. At the time I examined the patient she complained of pain in weight-bearing only. In attempting any unusual exertion, as in walking considerable distances, she was compelled to limp and the pain became severe.

The patient was quite sure that the condition dated from and was due to a game of tennis in which she "stubbed" her foot. The pain was severe at the time; it was considered a sprain and she was able to be about the next day.

My examination disclosed a well formed and apparently strong foot. The metatarsophalangeal articulation of the second toe was thickened, on palpation, and very tender to pressure. Passive movement of this joint was very painful and accomplished by slight grating. The X-ray (Fig. 1) showed quite clearly that the distal end of the second metatarsal has been crushed in, causing the articular surface to lose its curved outline. There was apparently a small loose body in the joint about two mm. in diameter.

The treatment consisted in applying a felt pad to the plantar surface of the foot by means of adhesive plaster, so that its anterior end was placed just back of the injured joint. In this case I also had a steel plate inserted between the layers of the sole of the boot in order to deprive the foot of the motion in the metatarsophalangeal joints, in walking. I have not done this in my later cases.

The patient was able to walk painlessly without the pad within six weeks and has had no further trouble with this foot. The other foot has always been entirely normal.

I find it unnecessary to report each of my cases in detail, as they have such great similarity except as noted below.

Fig. 2 is from a girl of fourteen in whom the injury was also received in playing tennis. The radiogram was made about three months after the injury. The injury had, however, been quite forgotten by the patient and was only recalled by my questioning on this point. There is no loose body in this joint and there was no grating on motion.

Three of my six cases have shown loose

Read at the meeting of the Southern Surgical and Gynecological Ass'n., Atlanta, Ga., Dec., 1913.

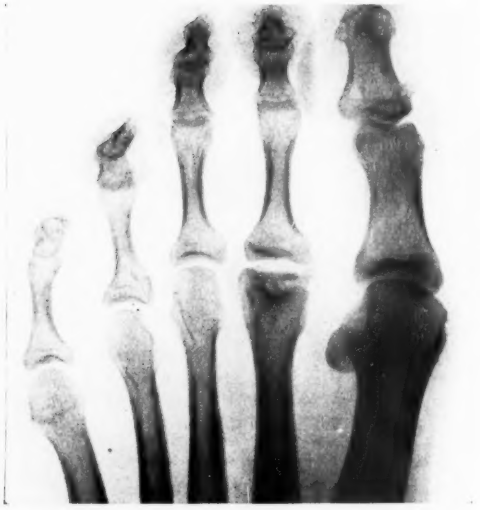


Fig. 1. Case 1. Girl of sixteen years. Tennis injury six months before. Infraction of second metatarsal with one small loose body. No arthrotomy required.

bodies in the radiogram, and grating upon examination. In two of these three cases I was unable to give definite relief by mechanical support alone and, therefore, removed the loose

Fig. 2. Case 6. Girl 14 years. Injury three months before. No loose body.

bodies by means of an arthrotomy from the dorsal surface of the foot. This resulted in entire relief from discomfort and pain.

Fig. 3 is from the second of these operative cases and shows two loose bodies of considerable size, one of which was attached at one place by means of a fine pedicle. This was also a tennis injury.

It is a curious fact that in two of the six cases, no injury whatever could be recalled by the patients in spite of careful questioning on my part. In one of these cases operative

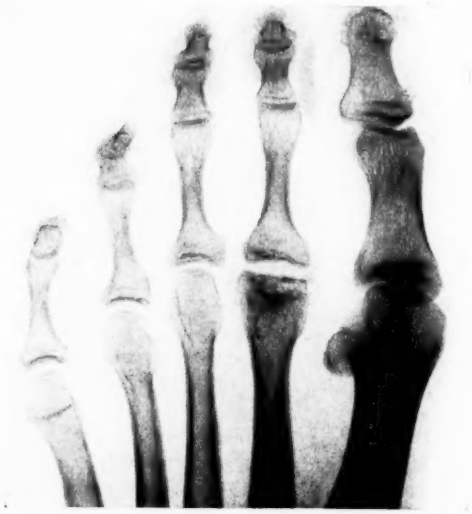


Fig. 3. Case 3. Girl, 20 years. Tennis injury one year before. Infraction of second metatarsal with two large loose bodies which required removal. There was marked grating during passive motion.

removal of small corpora libera was necessary. I have no doubt of the traumatic origin of these three cases.

Two of my cases were women below middle age, but the remaining four were girls under eighteen years of age. In two of the six cases there was evidence of static incompetence of the feet. I have no reason to believe that this stood in any particular relationship to the condition which is here described.

Having observed six cases of this character in my own practice there would appear little doubt that the condition which I have described is not extremely infrequent. It is very

likely that the similarity of symptoms to those of weak feet has caused it to be overlooked. While those cases in which there are no loose bodies will be relieved by the use of the felt pad if sufficiently long continued, the contrary will be true of the other cases. The cases with loose bodies will require arthrotomy as a rule. As in my first case, this may be unnecessary where the bodies are very few in number and very small.

It seems worthy of note that in my six cases only one foot has been the seat of this injury. While it is common enough to see only one foot affected in cases of metatarsal pain from static weakness, the contrary is the rule. This would seem, therefore, to be a point of some diagnostic importance.

Not a little interest attaches to the mechanism by which this injury to the foot takes place. Under normal circumstances the second metatarsal bone is slightly longer than the first. In the presence of a diminished power of toe flexion and especially of the great toe, it is apparent that forcible impact of the ball of the foot against the ground not sufficiently guarded by the flexor power of the toes will cause the distal end of the second metatarsal to bear the brunt of the blow. It seems likely to me that we have here the explanation of the mechanism of this injury.

CONGENITAL CONTRACTURES OF THE FINGERS, WITH THE REPORT OF A CASE OF THE FAMILIAL TYPE[1]

By HAROLD NEUHOF, M. D., and EDGAR D. OPPENHEIMER, M. D., New York City

ALTHOUGH congenital contracture of the fingers is not infrequently encountered, little attention appears to have been devoted to the condition. When mentioned at all in standard works on general and on orthopedic surgery the description of, and treatment for, the deformity are generally disposed of in a few words. The reason for this appears to be that individuals affected by this deformity do not usually consider it of sufficient importance to seek medical aid; nevertheless we have encountered case reports of many patients who have been seriously incapacitated by the affection.

The examination of the following example of congenital finger contracture, with the operative findings and the results of operation, have appeared to us of enough moment to justify its report and to analyze what is generally known of the condition at the present time.

Mary J., twenty years old, unmarried, came under our observation with the history of contractures of the fourth and fifth fingers of both hands existing since birth. The affection was not very annoying until the age of about fourteen years was reached. Since then, however, the flexion of the fingers of the right hand has apparently progressed. The result has been that, in the past two years, the patient's occupation (that of ladies' maid) has been seriously interfered with, for she frequently drops objects carried in the right hand. She also wishes to be relieved of the unsightliness of the deformity.

Family history. The mother of the patient has had a bilateral contracture of the fourth and fifth fingers since birth; it never progressed very far and has never been very annoying. The patient's maternal aunt, however, has had the same condition, from birth, to a much more marked extent, so that her hands have never been very useful for household work. An operation done on one hand (tenotomy?) was not successful. The maternal grandfather had contractures of the fingers similar to those of the patient. No other members of the family are affected and there is no history of other deformities among them.

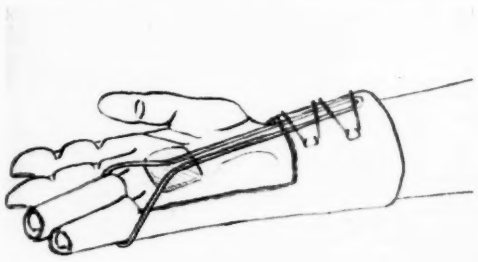
The previous history of the patient throws no light on the etiology of the deformity. She has always been well and strong and free from symptoms of constitutional disease. Although the con tractures of the fingers were observed by the mother soon after birth, no attention was given to them because they appeared so insignificant. About the period of adolescence, however, the patient believes that the flexion of the fourth and fifth fingers of the right hand was more marked than that of the left, and, although she could previously force a full extension of all the contracted fingers, it was no longer possible to fully extend those of the right hand. The contractures of the fingers of the right

[1] Presented in part before the Hunterian Society, November, 1913.

hand appeared to slowly progress, and, in the past few years, to very slightly involve the middle finger.

The general physical examination revealed a healthy young woman of good physique, free from other deformities. The contractures of the *left hand* are, to a very much slighter extent, a replica of those of the right. The proximal phalanges of the fourth and fifth fingers are slightly hyperextended and the second phalanges are flexed to an angle of about 110 degrees on the proximal ones. The distal phalanges are not flexed on the middle ones. The flexion contracture cannot be overcome, the resistance apparently being in the subcutaneous tissues of the palmar aspect of the proximal phalangeal articulations. Here there is a weblike appearance of the skin; upon palpation, it could be ascertained that the resistance to extension was *not* in the skin, but lay, apparently, in a tense, fascia-like band that could be distinctly felt under the skin. Free motion exists in all the articulations.

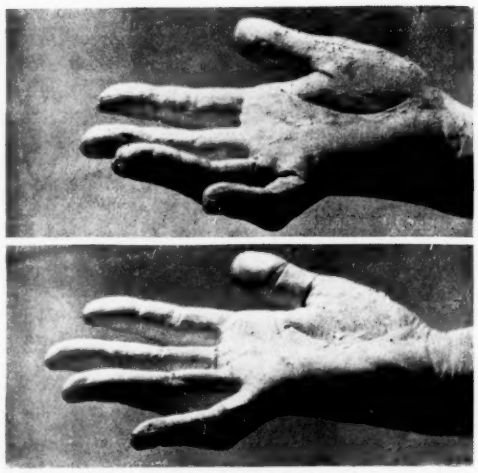
The contractures of the fingers of the *right hand* are much more extensive than those of the left.



Oppenheimer splint for maintaining and increasing extension of fingers.

The proximal phalanges of the fourth and fifth fingers are more markedly hyperextended and the second and third phalanges (lying in one plane) are flexed on the first to an angle of about 45 degrees. The dorsal surfaces of the proximal phalangeal articulations are very prominent. The skin over the palmar aspect of the proximal phalangeal articulations is thinned and free from creases, and makes a weblike fold in the long axis of the fingers. As in the left hand the cause of the contractures appears to be a firm band that is felt under the webbed skin. Any effort to straighten the fingers makes these bands very tense. All the phalangeal as well as the metacarpophalangeal articulations are freely movable. The flexion power of the fingers is good; adduction and abduction, however, seem somewhat weak. Electrical tests are negative. Sensation is normal. A slight degree of contracture of the same type exists in the middle finger.

X-ray examination of the fingers of the right hand, stereoscopically made, shows that the bones and joints are normal. The first and second phalangeal



Plaster of Paris casts of right hand before and after operation.

articulations of the fourth and fifth fingers are in flexion; the usual space separating the heads of the bones is distinctly seen, and no abnormality of the joints can be determined.

Operation. May 13, 1913. (Neuhof.) Local anæsthesia. The operation generally recommended (in the scanty descriptions found) is a V-shaped incision of the skin, which, when converted into a Y, is supposed to relieve the contracture. A V-shaped incision was accordingly made through the weblike skin over the palmar aspect of the proximal

(a) Right hand before operation.
(b) One month after operation.

joint of the little finger. The skin was firm and thin, very little adipose tissue underlying it. The ends of the V were prolonged over the lateral surfaces of the finger and the flap thus made was reflected. The very tolerant patient permitted vigorous attempts at extension of the finger, but no change could be effected. Fascial prolongations entering the skin flap were looked for but not found. It was, therefore, determined to divide the firm band that was felt under the skin (see description of the case). This fascia-like membrane, immediately overlying the flexor tendon sheath, was accordingly divided, but not the least relief of the contracture resulted. The tendon sheath was then exposed; it was evident that neither the sheath nor the tendon played any rôle in retaining the finger in its flexed position. The joint capsule and ligaments alone remained to account for the contraction. With a narrow-bladed knife the anterior ligaments were at first cautiously incised under the flexor tendons; some extension of the finger was at once obtained. The more lateral portions of the joint capsule and ligaments were then superficially incised; by using a little force almost full extension at the proximal articulation could be obtained. This was accompanied by faintly audible and palpable cracklings (as if periarticular adhesions were being broken). A few catgut sutures approximated the subcutaneous tissues. Owing to the extension of the finger the V-flap could not be sutured in place and the V was, therefore, converted into a Y-shaped suture of the skin, without any resulting tension.

The operation was repeated on the fourth finger. The experiences were exactly the same as those of the operation on the little finger and, therefore, need not be repeated.

Splints and a dressing were applied, immobilizing the fourth and fifth fingers in full extension. The wounds healed by primary union. Two weeks after the operation it was found that the fingers, although in almost complete extension, showed a tendency to flexion, and the following apparatus was, therefore, devised by Oppenheimer.

A small anterior splint with a band around the affected phalangeal joints is the one generally employed for maintaining and increasing extension of the fingers. The objection to the splint is the pressure on the finger pads, which may be very painful and even lead to localized necrosis. The circular band may interfere with the circulation in the finger. The splint is not easy to adjust or to keep in place. The apparatus we employed was made on a plaster model of the hand, the fourth and fifth fingers of the model being broken and overcorrected. Layers of cloth painted with celluloid solution were applied over the plaster cast; reinforcing steel wires were placed between the layers of cloth. The resulting splint fit snugly and was light and very strong. It was cut away over the palm and the metacarpophalangeal articulations (see diagram). The hyperextension at the latter joints nullified the extension-effect of the splint. A small felt pad was therefore placed over these articulations and was the fulcrum for a wire spring encircling the fingers at one end and included in the wrist-band at the other. The splint could be put on like a glove, the strap for attachment being at the wrist.

This appliance was worn continuously for about two weeks and subsequently at night for several weeks more.

The result, as ascertained at a recent examination, is a useful hand with good power and degree of flexion and extension, adduction and abduction of the fourth and fifth fingers (see photographs). The prominence of the dorsal aspect of the proximal phalangeal articulations remains almost unchanged. This could be improved by an osteotomy, which we considered inadvisable, for the indication would merely be a cosmetic one.

The description of the case herein presented might serve as a typical example of congenital contractures of the fingers. In some particulars, however, and especially in the experiences at operation, it differs from previously reported ones. A survey of the subject may, therefore, be permitted.

Concerning the etiology of congenital finger contractures very little is known and no satisfying theory has as yet been advanced to explain the mechanism of its formation. According to some observers the cause lies in the weblike formation of the skin. That this is not the case is amply proven by examination of these finger contractures in children. Adams,[1] in the best paper we have found on the subject, shows "that there is no appearance of congenital skin contraction, or formation of a longitudinal web in the finger, when seen in early childhood. I have taken casts from young children that show transverse creases on the palmar aspect of the phalangeal articulations as well defined as they naturally should be." In addition, we wish to point to the fact that the fold of the skin, though

[1] Adams on Finger Contractions and Hammer-Toe, Second Edition, 1892.

short, is not tense and showed no evidence of having been under tension. The free dissection of the web that was made in our operations in no way relieved the contractures. Another suggestion for the explanation of the condition is that offered by Adams. He studied some of the cases in early childhood and found that the only defect then present was "a dropping of the second and third phalanges, apparently from some failure of the power of extension." He, therefore, suggests that the cause may be a "failure or imperfect development of the lumbricales or interossei, whose special office it is to aid in the power of extending the second and third phalanges." That this is not the case, however, is shown by Adams himself, inasmuch as he reports finger contractions, treated in early stages by extension apparatus, entirely well (i. e., full extension) after the treatment. Furthermore, in the case upon which we operated, good extension, adduction, and abduction power promptly returned to the contracted fingers after the obstruction to extension was removed. The inefficacy of tenotomy for the relief of the condition clearly shows that it does not depend upon flexor-tendon shortening.

Heredity plays an unquestioned rôle in congenital contractures of the fingers. Indeed, an examination of the literature of the subject leads to the conclusion that the cases of congenital finger contractures may be divided into two groups, the familial and the isolated. We have gained the impression that the former generally presents contractures of the fourth and fifth fingers of both hands; the latter, often of the fifth finger and in many instances unilateral. This statement cannot be more definite because the details of many of the reported cases are so meager. The impression has also been gained that the contractures of the familial type are generally more severe. In some of the reported families many of its members were subjects of the deformities; usually, however, not more than two or three of one family are involved. None of the histories we have seen describes the lesion in more than two generations; the patient we have reported is a member of a family in which the affection runs through three generations. In view of the pronounced hereditary tendency, congenital contractures of the fingers should not be considered an accidental anomaly of development, but rather a developmental fault. It is interesting, in this connection, to note that the condition is not very uncommonly associated with hammer-toe and other deformities.

Before proceeding with the symptomatology and treatment of congenital finger contracture it may not, perhaps, be out of place to indicate that it bears no relation or similarity whatever to Dupuytren's finger contractures. Attention has been called to this, nevertheless we find that both conditions are not infrequently grouped under one head. Dupuytren's contracture is an affection of the palmar fascia, an acquired disease of adult life, occurring chiefly among males. Both the central and the lateral digital prolongations of the palmar fascia are involved and, as a result, the proximal phalanx is held in a flexed position. Congenital contracture of the fingers, on the other hand, is observed soon after birth and is most common in females. Neither the central nor the lateral prolongations of the palmar fascia is ever involved and the proximal phalanx is generally held in the hyperextended posture. The operative findings in the two conditions vary accordingly.

That congenital contracture of the fingers may be of very slight extent and give rise to little or no inconvenience was indicated in the introduction to this paper. This is far from being an invariable rule, however. The inconvenience of the contracture is generally in direct proportion to its extent, but some cases are reported in which considerable annoyance appears to have resulted from comparatively mild grades of the deformity. In describing the clinical history of congenital finger contractures three stages were observed by Adams. No other writer appears to have studied these cases from early childhood through adult life, and we can, therefore, do no better than to follow his classification and description.

The first stage of congenital finger contracture is generally noticed by the parents when the child is from one to two years old.

The condition consists in a "dropping" of the second and third phalanges on the first. They can be restored to the normal position by gentle manipulations but drop again as soon as the extending force is withdrawn. No evidence of muscular or tendinous contractures, no bands, and no appearance of shortening of the skin are to be observed in this early stage. The second stage, generally reached in the seventh to the tenth years of life, consists in a confirmed contracture of the fingers. The first phalanx is hyperextended, and the second and third phalanges, lying in one plane, are flexed to a varying degree on the proximal one. The skin over the palmar aspect of the first phalangeal joint is of a folded, weblike appearance, the web lying in the long axis of the finger. The transverse creases of the skin are less evident than normally in this atrophic contracted fold. There is no evidence of muscular contracture, but, in most cases, fascial bands are to be felt along the palmar aspect of the first and second phalanges. The affected fingers cannot be straightened out by any amount of force. The resistance appears to be partly in the contracted skin and fascia and *partly in the contracted condition of the articular ligaments by adopted shortening during growth.* Especial emphasis is placed upon the latter because the shortened ligaments and capsules of the proximal phalangeal joint proved to be the barrier to extension in the case upon which we operated, and because several reported unsuccessful results of operation appear to have depended chiefly upon nonrecognition of this ligamentous shortening.

Spontaneous arrest of congenital contracture of the fingers in the first or second stage unquestionably occurs in many instances, but an increase of the contraction occurs in a certain proportion of the cases. This progression of the flexion-contracture, occurring in the fifteenth to the twentieth year of life, comprises the third stage, according to Adams' classification. In a considerable proportion of cases reaching this stage the contraction involves not alone the fifth and fourth fingers, but the third and even the second as well. The flexion of the terminal phalanges of the affected fingers gradually increases so that the hand becomes progressively less and less useful. Extension of the fingers is impossible; when it is attempted, flat fascial bands, of the same type as those described in the second stage but of more pronounced extent, are to be felt and seen. Because these central longitudinal bands do not correspond to the digital prolongations of the palmar fascia, it is difficult to account for their occurrence. Adams believes that they represent an involvement of the terminal fibers of the fascia inserted into the skin. At the first operation he performed for finger contracture he "found it necessary, after dividing some small bands transversely, to pass the knife horizontally under the skin and divide numerous bands passing upward towards the skin." The operation he performed was a subcutaneous one. In the description of the open operation we practiced, attention was called to the fact that the flap of skin, comprising the web, was reflected without any such contracted fascial prolongations into the skin being encountered. Indeed, it was surprising that no fascial band was met and it is now our impression that the band in question is a combination of contracted skin, subcutaneous tissue, and articular ligaments and capsule.

The treatment of the first stage of congenital finger contracture should be purely mechanical. Good results are obtained if one of the varieties of extension splints is worn for a considerable period of time. After the flexion of the affected fingers is controlled the splint need be worn at night alone. It is for the second and third stages of finger contracture that operative measures are indicated. Some of the procedures devised are plastic operations on the shortened skin, subcutaneous and open division of the fascia, tenotomy, osteotomy, etc. Each of these methods has been followed by a considerable percentage of failures. Even amputation of the finger has been found indicated in order to eliminate the useless and unsightly digit. The operation advised and practiced by Adams was successful in a few cases. At two or three points in the contracted zone a narrow-bladed knife is introduced. All resisting fascial bands are divided and the scalpel is then carried horizontally to and

fro, parallel with the skin and immediately underneath it. All "fascial prolongations into the skin" are supposed to be divided by the latter procedure. After the operation an *extension apparatus is applied and must be continuously worn for three to six months.* The apparatus is so constructed that steadily increasing extension of the fingers can be carried out. After full extension has been reached and there is no tendency to return of the contracture the apparatus need be worn at night alone; this period is also of many months' duration. It is unfortunate that Adams did not enter into details of the results he obtained by his plan of treatment. No definite statement is made of the final degree of extension of the fingers, of the extent of flexion, adduction and abduction, of the painfulness of the post-operative corrective treatment, etc., etc. Several criticisms must be directed against his method. First, the operation is done blindly, with the possibility of damage to tendons and nerves. Secondly, very prolonged after-treatment by apparatus is necessary, making the hand quite useless for work for many months. Thirdly, the contracture is incompletely relieved by the operation, apparatus being depended upon to bring about the full degree of extension. It is evident that the apparatus may not succeed in cases presenting pronounced contracture of the articular ligaments. Fourthly, when the contracture of the articular ligaments is the chief barrier to extension, as in our case, the operation would prove futile.

The method of treatment employed by Adams has been somewhat minutely considered (to the exclusion of other methods) because it appears to be the only one that has been carried out methodically in a number of cases. It cannot be strongly recommended, however, on account of the objections above advanced.

The procedure that we have carried out appears to us to be a much more logical one, especially for advanced grades of finger contracture. It is based upon the demonstration that the contracted ligaments and capsule of the proximal phalangeal articulations are the chief barriers to the extension of the affected fingers. The details of the operation are described in the report of the case. It consists essentially in a V-shaped incision of the web overlying the proximal phalangeal articulation, reflection of the flap of skin, exposure of the tendon-sheath, and incision of the articular ligaments and capsule. The latter are first partly divided on the palmar aspect of the finger to determine if full extension can then be obtained; if necessary, the lateral ligaments are partly divided. The periarticular adhesions must then be broken in order to obtain full extension; some force may be required for this maneuver. Unless osteotomy of the first or second phalanx (or of both) is added, some prominence of the dorsal aspect of the proximal phalangeal joint will remain; osteotomy, however, can only be indicated for those cases requiring a perfect cosmetic as well as functional result.

MODERN WAR SURGERY

By RICHARD J. BEHAN, M. D., Pittsburgh
Surgeon, Fourth Reserve Hospital, Nisch, Servia

THE injuries due to bullets, in modern warfare, are so slight and relatively harmless that one who is not familiar with such injuries must wonder at the insignificance of them. However, with these minor injuries are associated more severe ones due to the bursting of shells, etc. As but few reports have recently appeared in English journals in regard to the injuries received in modern warfare, I have incorporated my observations in the following article. These observations were made principally during the last Balkan war, although I also had personal experience in the first Balkan war. During the last Balkan war, I and two other Americans were stationed in the fourth Military Reserve Hospital in Nisch (Servia). This city lies in the southeastern part of Servia and is at the junction of two railroads, one leading to Pierot, thirty kilometers distant, where the second army corps was stationed, and where during the war many battles took place. The other road led toward Ueskub, which was a distributing point for the wounded from the first and third army corps, stationed in Macedonia on the Bulgarian border (Fig. 1). Here during the entire war the fighting was very severe, and as it was in a wild and mountainous country transportation facilities for the wounded were very poor.[1]

At the beginning of the war most of our wounded were received from the neighborhood of Pierot. Later, most of them came from Ueskub. The wounded who arrived from Pierot had in the majority of cases been injured a few days previously. Their wounds as a rule were in a fairly clean state and healed without complication. However, on the contrary, the wounds of those who came from Ueskub were usually infected and very dirty. These poor fellows had been on the journey from the battlefield to our hospital seven days or more, and during this entire time but few had had their dressings changed. Some were en route much longer than this, especially those who during the journey had to endure a five days' quarantine against cholera in Ueskub. Many of the latter, owing to the lack of physicians, had never had a dressing changed. As a consequence, it was no great rarity for us, on removal of the dressings, to find the wound filled with maggots and vermin of all kinds. It is useless to say that among this class of cases the wound infection was very severe and dangerous. Many of the wounded had lost their bandages during transport, so that the wounds were exposed to the dirt which surrounded them. This loosening of the bandages was no fault of the military doctor, because in ninety per cent of the cases bandages were applied by a partially trained soldier-nurse who did the best he could.

The mode of treatment of the wounded on the battlefield was, *First*, to stop, if possible, fatal hæmorrhage. *Second*, to transport, with as great ease as possible, those who had wounds of the chest or abdomen (Fig. 2). *Third*, to apply splints, made of binders' board and starch roller bandages, to fractured limbs. In case binders' board was not at hand, a metal splint or thin strip of wood was used. Usually the parts were not shaved, or if so, only in a rudimentary way; and most of the cases were not even cleansed with soap and water. In nearly every case tincture of iodine, 5 per cent, was liberally applied to the wound in the surrounding area; then dry white gauze was laid over the wound and bound in position either by means of adhesive straps or by a gauze bandage.[2]

[1] During the war the second army lost 3,000 wounded and 900 killed. The first and third armies lost between 29,500 to 30,000 wounded and 7,000 dead. This does not include the deaths from disease such as cholera, etc. In Nisch there were four reserve hospitals, one military and one civil hospital. These accommodated, during the war, 8,000 patients, 2,000 of whom were treated in our hospital. This had formerly been a cavalry barracks, but had been transformed into a hospital and accommodated 1,080 patients, our average number being about 900. At the close of eight weeks of activity there were left in the hospital 88 cases. These were removed to the military hospita land our hospita l was closed.

[2] It was fortunate indeed that the parts had not been cleansed with water, for it was to this non-interference that most of our good results were ascribed.

We never saw a bandage made of plaster of Paris. Most of the bandages for fractures and large infected wounds were made of starch-impregnated gauze. These held extremely well and in nearly every case were in good condition when they reached our hospital. However, in some infected cases the surgeon had neglected to cut a window in them to permit the exit of pus, etc. Even these cases, although they looked very bad, after we had cleansed the wounds and applied iodine or alcohol, 50 per cent, recovered nicely. Yet it was evident that, even in the cases in which the possibility of infection was at all present, it was best to be very careful in regard to the bandage. In these cases a large window should always be cut in one bandage so as to permit of the exit of pus, etc. Some of the patients when they arrived at the hospital were suffering from shock, a peculiar traumatic neurasthenic state which I shall describe later.

Upon arrival in the hospital we divided the wounded into two classes: the light and the severe. The severely wounded were at once examined and their injuries dressed. In no case was an immediate operation undertaken. The lightly wounded were not, as a rule, touched unless the bandage had become displaced during transportation, unless an elevation of temperature or of pulse was noticed, unless the bandages became saturated with discharge or the pain became unbearable. In case none of these conditions occurred, the bandage was changed first only on the fifth day. If the wound was clean, tincture of iodine was applied and over this a fresh dressing was placed. In no case was soap and water used on a wound, and in those cases in which it was necessary to shave the surrounding parts, alcohol was used to moisten the skin for the shaving. If the wound was dirty, the soiled material, cloth, etc., was removed as well as possible. Splinters of bone, if they were entirely free, were also removed. If they were connected with periosteum they were allowed to remain. In case of infected wounds, the wound was cleansed with gauze sponges moistened with alcohol. In some cases the wound was dried and tincture of iodine then applied; in others, the iodine was not used, and the wound was just dried; while in still others, a wet alcohol compress was used over the wound. From the latter we seemed to derive the best results. In case there was a large laceration, a supporting splint was also applied.

The nursing was very deficient, as we had for nurses only soldiers whom we had trained in a week's time. However, they did very well since after the first week we could ascribe no case of infection directly to them. Perhaps this may be accounted for by the care we took never under any circumstances to touch a wound with our fingers or with anything except sterile gauze or a sterile instrument. These instruments were boiled at night and at noon. During the dressing period from 8 to 1 and from 3 to 8 they were thoroughly cleansed each time after use and were then laid in 60 per cent alcohol. All our dressings were sterilized in drums during the night. These drums were placed in our dressing-room the first thing in the morning.

Our routine on going to the hospital in the morning was, first, to make our rounds, during which we examined each patient, looked at the dressings, and questioned the patients through a German-speaking interpreter as to pain, etc. Should we decide to change a dressing we marked a cross on it with a lead pencil. This indicated that the patient was that day to have his dressing changed. It was also the rule that, as soon as we entered the ward, all who were vomiting, or who had recently vomited, or who were suffering from diarrhœa, should at once notify us. These we examined closely for signs of cholera or dysentery. If we suspected cholera the patient was immediately sent to the isolation department of the military hospital at Chela Kula.

The sanitary arrangements in our hospital were very poor, the building having been previously used as a cavalry barracks. The rooms were low, the walls dirty, and the floors were of rather rough boards; the toilets were at a considerable distance from the building. The attendants were ignorant soldiers; the patients also, in the majority of cases, were very ignorant, and it has always been a wonder to me how we escaped an epidemic of cholera

or of dysentery. However, we were fortunate, and, though we did as a rule discover a case of cholera at least every third day, neither cholera nor dysentery assumed epidemic proportions. The patients were very docile and easily handled, though they were a little negligent in obeying orders. At first we had no local anæsthetics and had not the time to use general anæsthetics, so that all the necessary manipulations, incisions, etc., were made without the use of any anæsthetic at all. It was nothing uncommon for a soldier to faint during the dressing. He was laid upon the floor, given some cold water, and allowed to recover. After a short interval the dressing was completed.

The average daily number of cases dressed by another American surgeon and myself, in addition to our operative work, amounted to about 150. Major operations were not common. During the entire period of our stay they probably amounted to about two per cent of the cases. At first it was impossible, owing to the stress of our work, to systematically take histories, note conditions, and record results; but after the second week, when we began to be relieved of some of the routine by our soldier assistants, we were able to study our cases with more detail and to record our observations. During a period of one week we recorded 177 cases, which I shall later summarize. The entire number of cases treated by us in our pavilion during the seven weeks of our stay was 600. In the entire hospital during the same period 2,000 were treated. From the 177 cases of which we have exact records, only five died, a mortality of 2.8 per cent. This is extremely low in comparison to the mortality of previous wars. The lowness of it can hardly be due to the fact that we received only lightly wounded cases, because we were directly on the railroad from Pierot and Ueskub to Belgrade and received the unassorted wounded coming in many cases direct from the battlefield.

The experience of the other hospitals in Nisch did not differ from our own; and from personal observations made on visits to them, I am able to verify the fact that their wounded were not any more severely injured than our own. The only explanation of this decreased mortality must lie in the lessened destructiveness of modern implements of warfare. This decreased destructiveness may be due to the fact that the bullets are of a very small caliber, are covered with a steel mantle, travel with great velocity, and have an enormous energy with great penetrating power. For this reason the wounds of entrance and exit are small, and have no defined channel connecting them. The tissues are cut clean, and even large bones are perforated without being shattered, the bullet making a clean-cut hole through them. The steel mantle prevents the bullet from flattening out when it strikes the denser tissues of the body. Owing to the distance between the fighting divisions of the two armies, bayonet and saber wounds were very infrequent. Out of 177 cases we had only two bayonet and one saber wound. This corresponds with the experience of other surgeons who have served in recent wars.

We divided our wounded into two great classes: the clean and the infected. The clean wounds were handled as little as possible. In many cases the primary dressing was allowed to remain until the day of the discharge of the patient from the hospital. Then it was changed, and, if necessary, a fresh bandage applied. If the bandage became loose or was moistened because of serous discharge, the dressing was removed, the skin surrounding the wound was cleaned with benzin, and the wound itself was touched with tincture of iodine. A dry dressing was then applied. In no case was a clean wound sounded for the purpose of locating a bullet or of defining its course. We were supremely indifferent as to the presence or absence of a bullet in the tissues, and sought it only in case it gave rise to pain or inconvenience, or in case its presence was indicated by a superficial abscess or by a hard mass under the skin.

A bullet may also make its presence known by means of reflex or pressure phenomena. We had several of these cases where pain was produced by a bullet pressing upon a nerve, but it was deemed best not to interfere by entering upon a probably useless search.

It is pleasant to say that we had compara-

tively few severely infected wounds. Out of 177 cases we had only 24 severely infected. Of these, the greater part were lacerated wounds due to shrapnel. It seems that in these cases the cause of the infection very likely was the dirt, pieces of cloth, etc., which had been blown into the wound at the time of the explosion.

Another large class of infected wounds was those due to comminuted compound fractures. These have, as a rule, a large opening communicating with the air and are due to shrapnel or to shells. The comminuted fractures which have only a small opening in the skin frequently escape infection.

The non-penetrating wounds seem very prone to infection. Of our non-penetrating wounds probably 60 per cent were infected. The reason for this is hard to explain, but it may be due to the fact that the bullet at the time of its entrance into the tissues is losing its velocity and therefore has a greater explosive power than a bullet going at a greater velocity, so that more of the clothing is carried into the wound, and the tissue injuries along the path of the bullet are greater. For this reason, any bacteria which may have been carried in with the bullet find a place of lessened resistance where their growth is not greatly hindered. Their virulence, however, seems to be reduced, as abscesses resulting from the activity of these bacilli are very mild and seldom do great damage. Large hæmatomata, unless opened and drained, as a rule became infected so that they finally developed into large abscess cavities. It eventually became our routine as a prophylactic measure to open and drain all these hæmatomata; in no case did we introduce a drain. In two of our severe wounds, gas bacillus infection occurred. In one of these it was possible to save the patient by a shoulder amputation; in the other an immediate amputation of the leg was done, but the patient died. In one of our cases the bullet, in penetrating the leg, had evidently destroyed the anterior tibial artery. Gangrene had already developed on the entrance of the patient into the hospital, and while waiting for the line of demarcation to develop, tetanus set in. In spite of immediate operation the patient died. In this case we did not use prophylactic injections of tetanus antitoxin, since we did not have it at that time.

Owing to the expense, we very seldom made a prophylactic injection of tetanus antitoxin. Bier's method of hyperæmia was not used because we did not possess the proper means. However, the alcohol-moist dressings which we used acted in a somewhat similar way, for they produced an active instead of a passive hyperæmia. The result of this treatment was very satisfactory. In every case in which an abscess was present it was incised, all the pockets opened, and gauze or rubber-tube drainage introduced after the abscess cavity had been thoroughly washed out with alcohol (60 per cent). The results of this treatment were extraordinary: in a few days the infected wound showed only a clean granulating surface.

In considering the injuries produced in modern warfare, one is surprised at the great preponderance of the wounds of the extremities to those of the chest or abdomen. In our series of 184 injuries, 134, or 72.8 per cent, were of the extremities. Of the injuries to the trunk, 17, or 9.2 per cent, were of the chest, and 6, or 3.2 per cent, were of the abdomen. Among 184 injuries there were 15, or 8.1 per cent, head injuries. Of these, 5, or 2.7 per cent, were of the scalp; 2, or 1.08 per cent, were skull injuries; and 8, or 4.3 per cent, were face injuries.

Head injuries. While head injuries produce the greatest number of deaths on the battlefield, in the reserve and base hospitals the percentage of deaths from injuries of the head is very small. In those cases in which a bullet has been fired from a short distance, death, as a result of the extensive destruction caused by the bullet, occurs immediately. On the other hand, if the bullet has been fired from a distance, it may entirely perforate the head and produce little, if any, inconvenience. In some cases there is a momentary loss of consciousness, due possibly to slight concussion; in other cases the loss of consciousness following the entrance of the bullet continues for some time and is the result of hæmorrhage. These cases frequently die, especially if the middle meningeal artery is

severed; but if only a small vessel is injured they gradually recover, with more or less permanent functional brain disturbance. The diagonal bullet wounds of the skull are more dangerous than are the transverse or the anteroposterior. The latter are not so frequent, because in them the bullet frequently glances from the skull and produces nothing more serious than a scalp wound. Out of five scalp wounds, two were in the temporal region. In one of these the bullet was removed from the débris at the point of impact, while in the other the skull had only been touched. In both of these cases, signs of temporary increase in the brain pressure were present. Associated with this there was a temporary paralysis, in the first case of the arm, and in the second, of the right side of the abdomen. The chief symptoms which one meets in injuries of the skull are: *First*, a primary loss of consciousness; *second*, great secondary weakness, with incoördination and a lessoning of the intellect; *third*, sometimes a state of mental instability, and the patients cry and rave; *fourth*, head pain and dizziness; *fifth*, vomiting may occur; *sixth*, the pulse rate is decreased; *seventh*, signs of localized paralysis may also be present; Jacksonian epilepsy may occur; *eighth*, temporary blindness is frequent; *ninth*, in addition to the above symptoms may also occur nose-bleed, ear-bleed, facial paralysis, or ecchymosis in the conjunctiva. One or more of these symptoms may fail, but as a rule a sufficient number will be present to confirm the diagnosis of brain injury. The above symptoms are only confirmative of a probable diagnosis which is made from a study of the direction of the wound of exit in relation to that of the wound of entrance. Of the entire 600 cases which we treated in our wards there were only four complete perforating wounds of the skull. In one of these, in which the bullet had passed diagonally from the front to the back part of the skull through the temporal region, there was evidently a disturbance of the optic commissure, since the patient was not able to see, although the eyes reacted normally. In one other case the bullet passed directly through the upper part of the temporal region. There were no marked symptoms.

In every case of a bullet wound of the skull in which the patient feels well for a day or two and then complains of pain in the head, has a weak pulse, dizziness, in some cases stupor, and, at times, a severe breaking out of sweat (cold), one must consider a brain abscess. If an abscess is present it is necessary to define its location. Good localizing symptoms are, first, cramps, and then, a paralysis of the muscles of one or both sides of the body. In cases of brain abscess it is necessary to operate at once, as the condition is very dangerous and death may very quickly occur. If the skull has been hit in a diagonal direction, a depressed fracture is rather common. In either case, both tables of the skull may be involved, but in many only the external table is injured. In some of these injuries where the wound is extensive a brain hernia may be present (Fig. 3). This, however, is more of a prolapse than a hernia, since as a rule the dura remains intact. In some instances there may be an extensive destruction of the tables of the skull without any apparent external injury except the wounds of entrance and of exit. In such patients, in whom as a rule the head has not been shaved, we are surprised to find on shaving the scalp that the injury is many times more extensive than we supposed. In some the bone is entirely destroyed, while in others there is but a simple fracture. In one of our cases there was a fracture of the skull in the temporal region. This patient had completely forgotten the names of various objects, so that while he knew these objects he was not able to give them their proper names. However, if an object were held up in front of him and he was told its name, he would indicate that that was the proper name; but of his own initiative he was unable to tell the names of the different objects.

In another case of a wound in the temporal region there was a paralysis of the right arm and hand. This paralysis gradually improved, so that in two weeks the patient had entirely recovered. In instances of brain injuries in which the bullet has penetrated the skull, the question arises, When and under what circumstances should we undertake operative interference? In the second Balkan War we

did not follow the dictum of Watson Cheyne, who from his experience in the Boer War declared that all skull injuries should be immediately operated. However, his own results do not speak favorably for operative interference, for in three cases of perforating wounds of the skull on whom he did not operate only one died, while from nine operated cases four were improved and five died. This gives a mortality of 55.5 per cent, or an increase of 22 per cent over those which had not been operated.

Wounds of the face. Face wounds are relatively few. In one of our cases the bullet passed through the cheek on one side and out through the cheek on the other (Fig. 4), passing through and fracturing the lower jaw on both sides and perforating the base of the tongue. At the time of the patient's entrance to the hospital the tongue was so swollen that it was impossible for him to close his mouth, and nourishment could only be taken in liquid form and then only in the smallest quantities. In five or six days the swelling had subsided to such a degree that a coaptating splint could be applied. In another case the bullet had entered the cheek below the malar bone and had lodged in the skin beneath the lobe of the ear (Fig. 5). The bullet was extracted and the wound quickly healed, except that at the point of entrance a fistula persisted for a long time, and from it was discharged a thin fluid, evidently the secretion of the parotid gland. This discharge was very irritating and quickly produced a marked and extensive eczema of the same side of the face. The eczema was treated by zinc ointment, and improved as the fistulous opening gradually closed. The reason for the closure evidently was that drainage of the fluid took place into the mouth from a secondary opening almost directly opposite the wound of entrance.

Closely related to the wounds of the head are those of the neck. In only one of these had we cause to worry. This was a case in which the bullet had penetrated the neck a little to the left of the larynx and had come out further back on the right side. This patient, for several days, was unable to swallow and had to be fed by means of the stomach tube (Fig. 6). Recovery was complete.

Wounds of the thorax. Direct thorax injuries we found very frequent. Of 184 cases there were 17 thorax wounds; of these, 8 were penetrating. In four of the penetrating wounds hæmothorax occurred, in one as long as fifteen days after the injury. In this latter case the patient had apparently completely recovered and was going around the hospital when he became short of breath, began to cough, and had a pain in the affected side The shortness of breath and coughing increased, and when I examined him two hours later I found the chest full of fluid. The dullness extended as high as the nipple line on the left side. The patient was kept quiet, given morphine, and gradually recovered. Owing to lack of ice, we were not able to make any local application of it. In 3 of the 8 penetrating wounds of the chest, empyema developed. It was peculiar, however, that empyema took place only in those cases in which the chest had not been entirely perforated, and the entrance wound had not entirely closed. In these cases, when the wound remained open, the respiratory movements pumped the air in and out of the pleural cavity, so that secondary infection was more apt to occur. In such cases also bleeding when present was apt to continue, because of the absence of the slight pressure which is present to a greater or less degree at all times in the pleural cavity. We found that, after plugging up the entrance wound so as to make it air-tight, the hæmorrhage quickly ceased. In these cases operation is absolutely contra-indicated, with the exception of those in which the intercostal or the internal mammary artery has been severed. Injuries of these vessels may be presupposed from the location of the wound and the probable direction of the bullet. Under no circumstances should the wound be sounded. If ice can be obtained it should be applied to the chest. Cases of hæmothorax should be left in absolute quiet. However, it was not possible to control some of our patients; instead of remaining quiet they were rather active and moved about, and though their breathing was difficult they did not seem to suffer greatly from their hæmothorax. They all, with the exception of those who developed empyema, recovered without

accident. This is contrary to the experience of Senn, who asserts that there is very high mortality in hæmothorax when the patient is not kept sufficiently still. In bullet wounds of the lungs (Fig. 7) we have observed the following symptoms: *First*, dyspnœa which may be very marked, and is especially noticed in those in whom bleeding into the pleural cavity has occurred. *Second*, blood in the sputum. This occurs in most cases. In a few the quantity of blood is very great; however, it has no prognostic importance. *Third*, hæmothorax, which is rather common. In some, it may be present without producing any marked symptoms. In a few, infection occurs and empyema develops. In these, fever, rapid pulse, etc., make their appearance. *Fourth*, pneumothorax. This is frequently associated with hæmorrhage into the pleural cavity. If in cases of pneumothorax the wounds of entrance and of exit be hermetically sealed, it is found that the air is gradually absorbed, so that it finally disappears. In case of hæmorrhage which is diffidult to control, it seems, judging from clinical observations, that the production of pneumothorax would be beneficial because by this means the lung tissues are compressed and the bleeding vessel decreased in size. *Fifth*, emphysema. Subcutaneous emphysema is frequently associated with pneumothorax. It developed in two of our cases. Air-tight packing of the wound in the chest wall stopped the progress of the emphysema, but the air was absorbed only after a long period. *Sixth*, pneumonia. This sometimes develops in bullet wounds of the chest. It is generally localized to the area around the bullet and may terminate in an abscess. The symptoms of lobular, localized pneumonia, as a rule, make their appearance three to ten days after receipt of the injury. *Seventh*, hydrothorax. This also occurs, but as a rule presents no difficulties to the surgeon and the fluid is quickly absorbed.

Out of 600 cases we had only one in which we were able to define a probable penetration of the heart. It seems that cases of cardiac perforation are very seldom found in hospitals for the simple reason that most of the injuries of the heart result fatally on the battlefield. Cheyne, however, speaks of a case in which, from the position of the bullet tract, a wound of the heart must have occurred.

Wounds of the abdomen. These are so very harmless that in the present wars a laparotomy is seldom performed, for it seems to be less dangerous to allow the patient with a penetrating wound of the abdomen to remain in quiet than to institute operative interference. In two of our cases a bullet penetrated the abdomen below the umbilicus, while in a third case it penetrated above the umbilicus. In the first two cases the symptoms were very slight, while in the third disturbing symptoms, such as vomiting, pains, and increased sensitiveness over the lower abdomen, were present for a few days and then quickly disappeared. On the fifth day the patient, contrary to our orders, ate heartily, and in ten days left the hospital entirely recovered. In one of our patients the bullet entered the abdomen to the right below the umbilicus and had evidently lodged in the spinal vertebræ; paralysis of both extremities quickly developed, retention of urine was present, and shooting pains in the scrotum were complained of. This patient was operated on, and perforation of the small intestine was found. Death occurred in a few days from septic peritonitis. At autopsy the bullet was found lodged in the body of the second lumbar vertebra. Swelling of the vertebræ body in the direction of the spinal canal had occurred, so that pressure on the spinal cord was present. This accounted for the bladder and the other symptoms.

It has been held by Senn that bullet wounds below the umbilicus are more dangerous than above. In this regard Senn performed the following interesting experiment: He placed the body of an adult against a wall and then shot at it from a distance of thirty feet. The shots were sixteen in number. Of these sixteen, four penetrated the abdomen without injuring the viscera. All of these four shots passed through the abdomen above the umbilicus. All of the bullets which passed through below the umbilicus perforated the viscera; the same was true of the lateral shots. The reason for the non-perforation of the bowel in bullet wounds above the umbilicus

seems to be that in the standing position the intestines have a tendency to gravitate into the pelvis, so that a shot passing through the abdomen above the umbilicus would not meet any of them. However, in war-time the lessened mortality of abdominal wounds can hardly be attributed entirely to this factor, for in many cases it has been proved that the intestines have been perforated and that there were few, if any, disagreeable symptoms. The favorable outcome seems to be due to the very small wounds made by the small-caliber bullet. These wounds are so minute that the mucosa in most cases immediately blocks the opening and prevents the seeping out of the bowel contents. Another factor of importance is that at the time of injury the intestines as a rule are empty, so that on perforation there is little tendency for extravasation. It has also been found that the high-speed, small-caliber bullet may in some instances press the intestines aside, without perforating them. However, these factors are only active if the bullet has been fired from a considerable distance. Should it be fired from near at hand the explosive force of the bullet is so great that the entrance wound is large and ragged, and considerable destruction is done to the intestines and other viscera. Soldiers suffering with wounds of the abdomen should be very carefully transported. It has even been recommended that they be strapped to a stretcher and be so carried to the nearest large hospital. If stretchers are scarce, a starch bandage completely encircling the abdomen entending from the axilla to the thighs may be used. Windows should be cut in this bandage directly opposite the wounds of entrance. Symptoms associated with abdominal injuries are—

I. *Shock.* This as a rule quickly follows the receipt of the injury and is most marked in those who are weakened from hunger, thirst, and fatigue from long marches, especially if the fatigue is associated with the depression which follows defeat. Shock is manifested by: *First*, great debility. As a rule the patient falls immediately after receipt of the first shot and remains lying until help comes and he is carried away. *Second*, entire loss of vasomotor control. This is indicated through the pallor, the cold sweat, the rapid, irregular pulse, and the loss of consciousness. *Third*, vomiting. *Fourth*, incontinence of urine and fæces.

II. *Hæmorrhage.* This is fairly common, but as a rule is not especially dangerous to life. For a detailed discussion of this symptom see "Indications for Operation."

III. *Extravasation* of the contents of the bowel. This seldom occurs unless the injury has been produced by shrapnel or by shells.

IV. *Abdominal distention* is present as a rule when the intestines have been perforated, but may be absent even when perforation has occurred, the only indication of the perforation being a marked rigidity.

V. *Pain.* Severe pain in the abdomen may be present, and if the viscera have been injured is almost invariable.

VI. *Absence of peristalsis* is a good indicator of injury to the abdominal viscera.

VII. *Elevation of temperature.* This is not marked. We had several cases with one or more of the above symptoms, who recovered without operation. However, in some instances operation was necessary. On entrance into the hospital the question came up as to whether it were advisable to operate. It was our policy in every case to delay operation as long as possible. The danger of an abdominal operation during war-time is well expressed by McCormic, who, in speaking of his experience during the Boer War, says that a man when shot through the abdomen died only when he was operated, and remained alive when he was let alone.

Indications for operation. First, progressive bleeding. Should signs of abdominal bleeding occur and continue and become more marked, it is well to open the abdomen. However, one should not be too precipitate in operating, as sometimes the bleeding ceases after a certain interval just as it does in extra-uterine pregnancy. The best indicator of progressive bleeding is, of course, a progressive decrease in the hæmoglobin content of the blood. This may be determined by means of the Tallquist test papers. The pulse is also a good indicator. One should not depend upon the color of the patient as a means of determining the extent of the hæmorrhage, because it fre-

quently happens that there is an associated shock, which of itself produces marked pallor. Hæmorrhages in the walls of the bowel are frequently observed especially when the bullet has only scraped the surface (von Oettingen I, 167). Large vessels may also be perforated: as a rule, unless the vessel is of good size, the perforation is quickly blocked by a thrombus; however, if the opening is very large or if a laceration of the wall has occurred, severe and fatal hæmorrhage may result. The *second indication* for immediate operation is the extravasation of the bowel contents. This is rather difficult to determine unless the wound in the abdominal wall is extensive and allows direct inspection of the abdominal cavity. However, should the wound be small the absence of liver dullness and its replacement by an area of resonance, as a rule, indicates perforation of one of the hollow viscera. The above indications for immediate operation are similar to those given by Senn, Bornhaupt, Seydel, Hilderbrandt, von Oettingen, and others. In severe abdominal injuries in which a large part of the abdominal wall has been shot away or in which a small opening in the abdominal wall is accompanied by a strangulated hernia, immediate operation is imperative.

Prognosis. In general, the prognosis of abdominal wounds is modified by the character of the wounds, the relationship of the wounded to the transportation service, the method of transportation, and the kind of treatment. In the Franco-Prussian War (1870–1871) the mortality from abdominal injuries was 70 per cent. In the Russian-Japanese War the mortality was 50 per cent. In the Balkan wars it was much lower (exact statistics are not at hand). It seems that the immediate mortality from abdominal injuries is third, preceded only by that due to heart and head injuries. In the Boer War, Watson Cheyne observed immediately after the battle of Karey Siding twenty-five cases of perforating wounds of the abdomen. Of these, sixteen died; one was operated on, but died; the other eight recovered, giving a mortality of 50 per cent.

The favorable abdominal wounds usually run a very quiet course without disturbing symptoms. The majority have only a slight rise of temperature (up to 39° C.), slight abdominal pain, swelling of the abdomen, and absent peristalsis. As a rule they entirely recover in five or ten days; in some an abscess may form. In four such cases observed by von Oettingen, the abscess opened in very unexpected places and in a few instances was the cause of a delayed peritonitis. Von Oettingen also observed a case in which the intestinal wall became gangrenous from extension of the abscess. Hæmatoma of the abdominal wall may also occur; these as a rule are found only in the small pelvis. It is better to let them entirely alone unless they give rise to abscess.

Bladder injuries. Perforation of the bladder as a rule is not serious. It gives rise to only a transient hæmorrhage, blood being present in the urine for a few days only. As a rule no extravasation of urine occurs. Undoubtedly, perforation of the liver, the spleen, or the kidney must have occurred in many cases, although symptoms of such injury were never observed.

Extremities. Wounds of the extremities were very frequent, much more so than were those of any other part; and most peculiar was the fact that the lower extremities were injured more frequently than were the upper. From 184 cases we had 75 wounds of the lower extremities and only 59 of the upper. The reason for this I am unable to determine. Of the 59 cases of wounds of the upper extremity, 16, or 8.7 per cent, were of the arm and shoulder; 21, or 11.4 per cent, were of the lower arm, and 22, or 11.9 per cent, were of the hand. Of 75 wounds of the lower extremities (or 40.07 per cent of our total injuries), 27, or 14.05 per cent, were of the thigh; 24, or 13.04 per cent, were of the leg; and 24, or 13.04 per cent, were of the foot. Among these injuries, fractures occurred fourteen times, divided as follows: humerus, 1; clavicle, 1; radius, 6; radius-ulna, 1; femur, 1; tibia, 4. All of our fractures ran a favorable course and all were healed. In the infected cases the healing was slower, but in all the functional results were good, though deformity was marked. Many of the fractures had not been diagnosed in the field hos-

pital, and, in some instances, even when diagnosed came to us without fixation dressings. It was also difficult to control our patients and to restrain them from changing their dressings or leaving their beds whenever they felt any desire to do so. Our treatment was the usual one of reduction, extension, and retention by means of fixation dressing and splints. Instead of plaster of Paris we used starch bandages. These, if thick enough,—that is, if they were put on in seven or eight layers,—had practically the strength of a plaster cast. Between the layers of the starch bandage strips of binders' board were inserted, or else thin strips of wood were incorporated into the dressings. With such bandages it is possible for the patient, even with a fracture of the tibia or of the femur, to go about without danger of increasing his injury. In case the fracture has been infected it is an easy matter to cut a window, so that a daily change of dressing may be made. Fractures produced by the transverse penetration of a bullet through the bone are very rare and are generally due to shrapnel. As a rule the small-caliber bullet passes directly through the bone without injuring it to any great extent. It produces only a clear-cut hole, while the shrapnel produces as a rule extensive destruction. The above does not agree entirely with the experience of Küttner, who doubted that it was possible for a bullet to pass through a bone without causing a fracture (Fig. 8). Of the possibility of this we have convinced ourselves beyond the shadow of a doubt. However, if a bullet passes through the bone in a diagonal direction there is a tendency for it to cause a comminution of the bone. In a few cases of fracture we saw an extensive laceration of the soft tissues, but in many instances the only external indication of the fracture was a slight discoloration of the skin over the site of the break, the skin itself remaining uninjured. Swelling of the surrounding tissues sometimes takes place, and a large hæmatoma may develop. This was marked in those fractures of the lower extremities which had not been placed in a supporting splint during transportation to our hospital.

Bullet wounds to the tibia give rise to more fragments than do similar injuries of the femur or humerus. The cause of this probably is that the tibia is harder than the femur or humerus, and consequently is more easily shattered (Fig. 9). It was our custom in clean cases not to remove a fragment of bone unless it was entirely free and was not connected with the periosteum. In infected wounds the bone fragments were always removed. This custom was based upon the experience of Senn, who found that if the fragments were not entirely separated they should be allowed to remain, as in some cases new bone originated from them, and greatly shortened the period of healing. Wounds of the hand were fairly frequent. As a rule, in a shrapnel wound of the hand the small bones were fractured; in a bullet wound they were frequently uninjured (Fig. 10).

Joint injuries. In the Franco-Prussian War (1870–1871) the wounds of the joints amounted to 4.1 per cent of all the injuries; in the Spanish-American War, 2.5 per cent; in the Russian-Japanese War, 7 per cent. Injuries of the joints were seldom encountered, although from the points of entrance and of exit of the bullet it was possible to conclude that in many instances the joint had been traversed. In no instance did we have great difficulty, although in one case considerable effusion developed in the joint. It was never necessary to open a joint. This agrees entirely with the experience of Küttner, who reported that never in any case was it necessary for him to open a joint. In a few of our patients, although the fluid in the joint was not excessive, the pain was severe. Our treatment of joint injuries was very simple. It consisted only in immobilization and in the application of moist aluminum silicate gauze dressings. Our experience in regard to operative interference is contrary to that of Bornhaupt, who found it necessary in 37 out of 157 joint injuries to operate. In 14 cases he found it necessary to amputate. In one case it was the only salvation for the patient, as the joint had been infected with streptococci.

Nerve injuries. Nerve injuries are not so common. They are indicated either by paralysis or by radiating pain. They are characterized (Küttner) in that the dis-

turbance (i. e., the paralysis and hyperalgesia) quickly disappears, so that in two or three days after the receipt of the injury the pain begins to diminish and in eight to ten days the paralysis commences to improve, so that in a few weeks the patient is entirely well. In a few cases the paralysis remains and symptoms of nerve degeneration arise. In some instances the nerve does not seem to have been directly injured by the bullet, but rather to be affected as the result of concussion from the passage of the bullet through the tissues adjacent to it. These are the cases in which the disturbances are transitory and in which recovery occurs in a few days. That such a concussion effect can occur may be presupposed from the experience of Dent, who found severe hæmorrhage in the tissues at a considerable distance from the bullet channel. This hæmorrhage was not in any way connected with the channel of the bullet, and the intervening tissue was absolutely undisturbed; so in the same way it is possible to suppose that the concussion produced by the rapidly passing bullet may influence a nerve, so that a transitory molecular change occurs in its substance and results in a reduction of its power of conducting impulses. We had one case of neuritis as the result of a secondary infection. In a few instances we had pain (radiating), occurring at a considerable interval after injury, as the result of the involvement of a nerve in a callus or in scar tissue. We saw no injuries of the sympathetic such as were described by Fripp. In one of his cases the bullet entered the right angle of the mouth and passed out through the spinous process of the third cervical vertebra. In this case the bulb of the eye sank in, and the opening of the lids, likewise the pupil, were markedly decreased in size. In regard to the general treatment of nerve injuries, it may be said that they should be handled as conservatively as possible, and operation should not be undertaken if the lesion shows any signs whatever of improvement. If a nerve has been severed, the two extremities should be sutured. In case the nerve has been involved in a callus or in scar tissue, it should be freed and surrounded by fascia to prevent a recurrence of the former trouble. Küttner, however, found that in these cases operation availed but little, since the nerve as a rule was damaged by the same cause which gave rise to the scar or the callus.

Blood-vessel injuries. In modern warfare blood-vessel injuries are fairly frequent. Brentano found in the Russian-Japanese War that 4 per cent of all his wounds consisted of blood-vessel injuries, and that 7 per cent of all his operations were done on blood-vessels. This great frequency of blood-vessel injuries, which lead to aneurism, seems to be the result of the partial cutting through of a vessel by the small, rapidly passing bullet. In some cases disturbance does not occur for many days. Then attention is attracted to the parts by a small pulsating swelling, or else because of pain. On examination a small aneurism is found. Among our patients it was not possible to define any of these aneurisms, since we did not follow the cases for a long enough period after their discharge from our hospital. As a rule, most of the patients were only in the hospital, on an average, for a week. Acute hæmorrhage, because of perforation of a vessel, occurred in several instances. In one, owing to sloughing in the tonsillar region, a branch of the pharyngeal artery ruptured with severe bleeding. To control it, it was necessary to ligate the carotid. In another the brachial artery was severed, and moist gangrene of the arm and hand resulted. The gangrene extended so high that a shoulder-joint amputation was necessary. In another the femoral arteries were perforated: the femoral vein was thrombosed so that a high amputation of the thigh was required. In still another case the posterior tibial artery was destroyed and at the same time the bone was so badly shattered that it was necessary to amputate at the knee. In all of the above cases hæmorrhage was profuse and continuous, and, with the exception of the perforated femoral artery, developed several days after the entrance of the patient into the hospital. In the last of the above cases the bleeding was due to perforation of the artery by a sharp fragment of bone — the result of the disobedience of the patient, who, contrary to our orders, persisted in going about and in standing on his leg. Hæmorrhage from wounds of large veins

we never encountered. According to Küttner, with the exception of frequent cases on the battlefield, they never cause death. Küttner saw one such case in which the opening into the vein was plugged by a piece of the neighboring tissue. This acted as a temporary hæmostat and gave rise to a thrombus at this point.

Shock. There are two classes of shock encountered in war surgery. One is the acute,

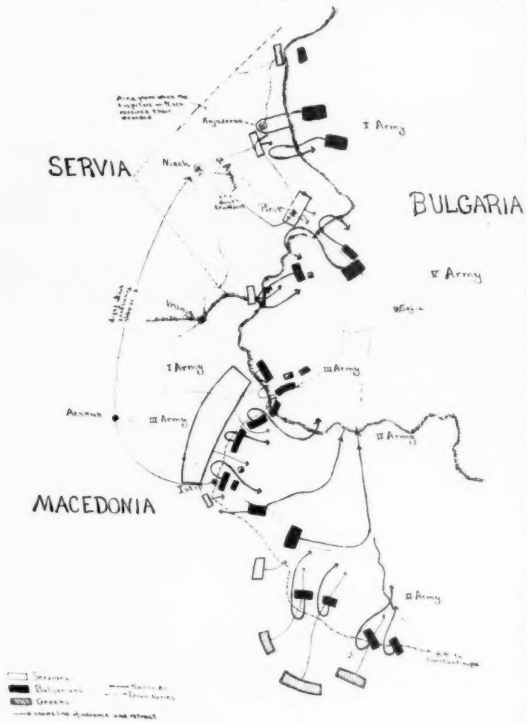


Fig. 1.

brief, temporary shock which comes on suddenly after the injury and quickly passes away. With this I have had no experience, as it occurs upon the battlefield. However, with the second variety (the chronic), which is long-lasting and somewhat dangerous to the patient, I have had considerable experience, for among our patients we had many who suffered from this most peculiar shock-complex. They were very weak, had lost all their energy, and were content to lie quiet and motionless. As a rule they had a very rapid pulse, 110 to 115, which was weak and thready; at the same time the respiration was increased. There was a tendency to moisture of the hand. Pain in the breast, chest, and abdomen was present in many cases. Likewise, in a few cases, pain was complained of in the head, especially in the forehead and temporal region. Finger tremor (very rapid) was present. The pupils were generally active and even. The respiration usually was painful and was of a somewhat asthmatic type. Blood was occasionally present in the sputum, but as a rule lasted only one or two days. Vomiting generally was absent. On examination of the heart, one was impressed with the hollow character of the sounds, especially of the second aortic. Dizziness was frequently a marked symptom. The heart on percussion appeared to be increased in size. This increase in size, together with the weak tone and the weakened apex impulse, led naturally to the diagnosis of a dilatation. These patients went around like old men and were incapable of the least exertion. In the majority of cases, we saw them first on the third to the fifth day after the onset and did not see the patients in the first stages of their trouble, but only in the second. Since the patient's memory was as a rule not good, and as he generally was stupid, it was difficult to obtain an accurate history; however, it appears that in most instances the shock was the result of the explosion of a bomb in the immediate neighborhood of the patient, generally at a distance of two to three meters. As a result of the explosion, the near-by soldiers were thrown a distance of three to four meters. They were immediately rendered unconscious and recovered consciousness only after a period of one to two hours. In some the unconscious period lasted longer. During their period of unconsciousness they frequently vomited, but afterwards could remember nothing of it. Patients with this symptom-complex as a rule finally entirely recovered; but it was weeks, sometimes months, before they were in condition to resume their usual occupations. The pathological changes pro-

ducing this shock syndrome, which resembles traumatic neurasthenia, are difficult to define, since autopsies on patients suffering from this disturbance have not been made. In one case, however, a laparotomy was performed because symptoms of hæmorrhage into the peritoneal cavity were present. On opening the abdomen no free blood was found, but small hæmorrhages underneath the serosa were seen over the entire small intestine. These small hæmorrhages seemed to be the result of severe traumatism to the abdominal wall from the explosive force of the bomb.

Fig. 2. One method of transportation. A very rough one.

To which phase of the force — that is, the compression phase or the vacuum phase — the shock is to be attributed is difficult to define. It may be due to the primary positive pressure (compression) which is exerted suddenly against the surface of the body at the time of the explosion. This may cause a strain and possibly a slight dilatation of the heart, from which it slowly recovers. The hæmorrhages in these cases were only indicators of a sudden elevation of blood-pressure in the vessels, the result, as one might say, of a severe compression of the body by the surrounding compressed air. Hæmorrhages into the brain cortex, that is, into the meninges, may occur as easily as into the serosa of the bowel. These hæmorrhages, if present, would account for the peculiar symptoms of the shock. Küttner describes a case of deafness and slight concussion (cerebellar), the result of the passing in the near neighborhood of a large granite shell. Hildebrandt, in the Japanese War, saw hæmorrhages into the conjunctiva of both eyes due to the same cause. In considering the cause of shock, we must not forget that the negative pressure succeeding the primary compression due to the explosion may in some way be instrumental in producing pathological changes giving rise to this condition. The sudden release of pressure from the surface of the body may give rise to hæmorrhages into the serous membranes.

Fig. 3.

Fig. 4.

Fig. 3. Wound of skull with hernia of the brain.

Fig. 4. In above patient the bullet entered the left cheek, passed through the tongue, knocking out a molar on each side and then came out through the opposite cheek. The tongue is so swollen that it was impossible to close the mouth. Condition rapidly improved. In two weeks he was discharged.

The hæmorrhages and the condition of shock may be the result of both of these forces. Up to the present time no experimental work has been done in this field.

Burns. It sometimes happens that burns of the face or other parts may occur, due to the explosion of shells in close proximity (Fig. 11).

Erysipelas. Only once did we have erysipelas as a complication. This patient was immediately removed to the isolation department of the military hospital at Chela Kula.

Cholera and dysentery. As in all large wars, in which considerable bodies of men take part,

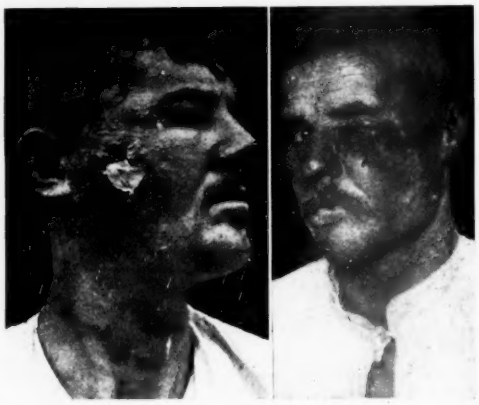


Fig. 5. Fig. 6.

Fig. 5. Bullet wound causing injury of the parotid with salivary fistula and subsequent eczema. The eczema proved extremely difficult to heal. It finally extended over the entire right face and neck and was cured only after the fistula was healed.

Fig. 6. Wound of the face causing loss of left eye.

especially in the Orient, it is difficult to entirely exclude cholera and dysentery. We were no exception to the rule, for in our hospital it was usual for us to discover a case of cholera every third day, and dysentery was very frequent. Both classes of patients were immediately removed to the isolation department and we were extremely fortunate to have no epidemic.

RÉSUMÉ

The experiences obtained by a surgeon in modern warfare are unique, for under no other circumstances would he meet so peculiar a variety of cases, nor would he see severe and what to him should be fatal injuries recover without serious inconvenience. He is compelled to modify his views in many particulars in regard to his treatment of shot wounds, for he will see many cases, which he formerly would have operated upon, recover without operation, while others with operation die. However, he should not apply his war experience to civil practice, for both are radically different, and what is proper in one is not called for in the other.

I would like further to draw attention to certain facts: *First*, that injuries received in modern warfare should be handled as little as is possible. *Second*, that dry dressings should be used, except in very severely infected wounds; for the latter, layers of gauze moistened with 60 per cent alcohol are the best. I would also like to draw attention to the fact that the most important factors having influence upon the ultimate course of a wound are the primary dressing and the transportation. Should the former be soiled, and the latter bad, the later course of the wound is unfavorable. Under no circumstances should wounds be touched with the hands. It seems from our experience that instruments which have been thoroughly cleansed with alcohol are entirely suitable for the handling of such wounds. In regard to statistics, I shall quote a few, though as a rule statistics of themselves, unless taken from vast material, are unreliable. First, in regard to the proportion of infected to clean wounds: Out of 166 wounds, 33 were infected and 133 clean; from these there were 137 wounds in which the bullet had entirely perforated and 29 in which the bullet did not pass entirely through the part. Of the perforated wounds, 12 were

Fig. 7. Bullet wound of the chest. Lungs perforated. No symptoms referable to the chest were present.

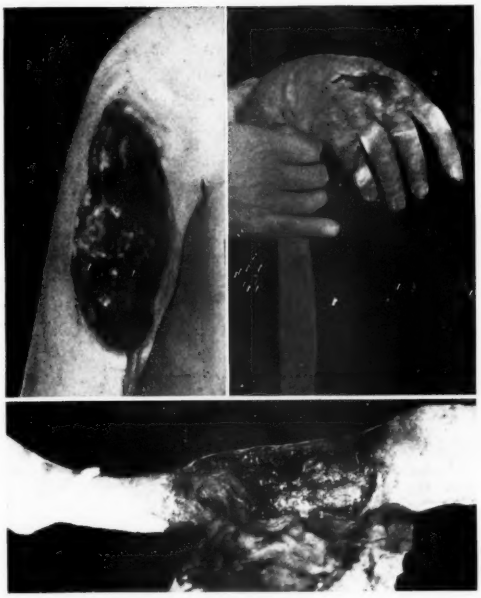


Fig. 8. Fig. 10.

Fig. 9.

Fig. 8. Large lacerated shrapnel wound of upper arm.
Fig. 9. Shell wound of exposure and shattering of the tibia and fibula.
Fig. 10. Shrapnel wound of the hand. Fracture of second and third metacarpal bones and second phalanx of little finger.

lacerated and 125 were not. Of the non-perforating wounds, 21 were lacerated and 8 were not. Of 154 wounds, 56 were due to shrapnel, 94 to bullets, 2 to bombs, and 2 to bayonets.[1] Of 184 wounds, 5, or 2.7 per cent, were of the head; 8, or 4.3 per cent, were of the face; 2, or 1.08 per cent, were of the skull; 5, or 2.7 per cent, were of the neck; 17, or 9.2 per cent, were of the chest; 6, or 3.2 per cent, were of the abdomen; 59, or 32.6 per cent, were of the upper extremities; and 75, or 40.18 per cent, of the lower extremities.

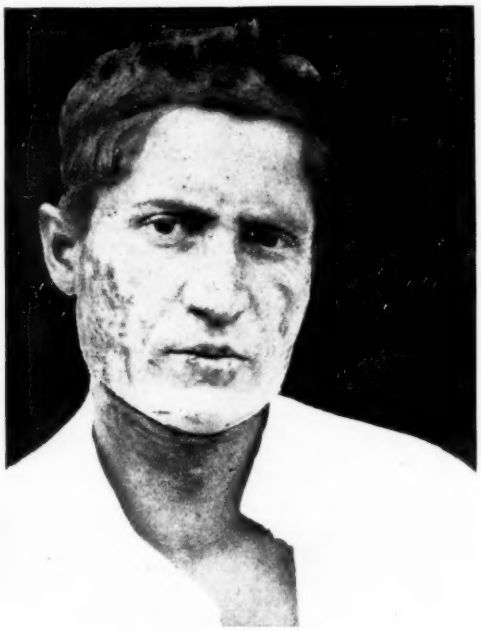


Fig. 11. Burn of face from too close proximity to an exploding shell.

BIBLIOGRAPHY

Bornhaupt. Über die Bauchschüsse im russisch-japanischen Kriege. Arch. f. klin. Chir., lxxxiv, 629; Gefässverletzungen und traumatische Aneurysmen im russisch-japanischen Kreige. Arch. f. klin. Chir., 1905, lxxvii, 590–630; Die Schussverletzungen der Gelenke im russisch-japanischen Kriege. Arch. f. klin. Chir., 1904–5, lxxx, 33.

Brentano. Über Gefässschüsse und ihre Behandlung. Arch. f. klin. Chir., 1906, lxxx, 394.

Von Bruns. Die neuesten Kriegserfahrungen über die Gewehrschusswunden. München. med. Wchnschr., 1900, No. 15; Inhumane Kriegsgeschosse. Arch. f. klin. Chir., 1898, lvii, 602.

Cheyne. The Wounded from the Actions between Modder and Driefontein. Brit. M. J., 1900, May 12; Experiences in South Africa. Lancet, Lond., 1900, Dec. 15, 1736.

Chienne. Erfahrungen in Südafrika. Scottish M. & S. J., 1901, Jan.

Von Coler and Schjerning. Vorträge über die Wirkung und kriegschirurgische Bedeutung der neuen Handfeuerwaffen. Berlin, 1894.

Colmers. Über Schussfrakturen im russisch-japanischen Kriege. Verhandl. d. deutsche Gesellsch. f. Chir., 1905, xi, 54.

McCormic. The Wounded in the Present War (Boer). Lancet, Lond., 1900, May 26, 1485.

Dent, C. F. In Regard to Small Arms Wounds and Humanity in the South African War. Über Kleingewehrverwundungen und Humanität im südafrikanischen Kriege. Brit. M. J., 1900, May 19; Surgical Notes, from the Military Hospitals in South Africa, Brit. M. J. 1900, p. 911; Bullet Injuries of the Nerve Trunks and the Spinal Cord, p. 406; Bullet Injuries of the Head, p. 471; Slighter Bullet Wounds, p. 662, Small-bore Rifle Wounds and the Humanity of the Present War, p. 1209; The Wounded in the Present War, p. 1285.

Fessler, J. Der Wundverband im Kriege. Deutsche Ztschr. f. Chir., 1906, lxxxv, 465.

[1] It is claimed that 5 per cent of all the wounds were due to sabers, swords, or bayonets.

FRANZ. Kriegschirurgische Erfahrungen in Deutsch-Südwest-Afrika. Arch. f. Klin. Chir., 1906, lxxxi, 134.
FLOCKEMANN. Kriegschirurgische Erfahrungen aus dem südafrikanischen Feldzug. München. med. Wchnschr., 1901, p. 278.
FLOCKEMANN, RINGEL, T., and WIETING, J. Kurzer Bericht über die im südafrikanischen Kriege von der zweiten (Hamburgischen) Expedition der deutschen Vereine vom Roten Kreuz gemachten Kriegserfahrungen. Fortschr. d. Med., 1900, xviii, p. 921.
FISCHER. Lehrb. d. allg. Kriegschirurgie, 1882. Verlag f. Renke.
FOLLENFANT. Guerre russo-japanaise. Impressions chirurgicales. Arch. de. méd et de pharm. mil., 1906.
LA GARDE. Gunshot Wounds by the Old and New Armaments. Buffalo M. J., 1902, July.
GOLDAMMER. Erfahrungen mit trockner Wundbehandlung im südwest-afrikanischen Kriege. Arch. f. klin. Chir., lxxx, p. 193.
GRAF and HILDEBRANDT. Die Verwundungen durch die modernen Kriegsfeuerwaffen, ihre Prognose und Therapie im Felde. Berlin, 1907.
HAGA. Kriegschirurgische Erfahrungen aus dem japanisch-chinesischen Kriege. Arch. f. Klin. Chir., 1894, lv, 245; Kriegschirurgische Erfahrungen aus der Zeit der nord-chinesischen Wirren. Arch. f. klin. Chir., 1900, lxxiv, 539.
HASHIMOTO and SAITO. Erzielung tragfähiger Amputationsstümpfe durch Nachbehandlung nach H. Hirsch im japanisch-russischen Kriege. Arch. f. klin. Chir., 1904–5, lxxxvi, 589.
HASHIMOTO, TOKNOKA, KUROWA, and TAKASHIMA. Über die prothetische Nachbehandlung der Unterkieferschussverletzungen. Arch. f. klin. Chir., lxxxviii, 191.
HASHIMOTO and KUSOIWA. Über Hirnabscesse nach Schussverletzungen im japanisch-russischen Kriege. Arch. f. klin. Chir., lxxxviii, 479.
HENLE. Über Kriegsverletzungen der peripherischen Nerven. Arch. f. klin. Chir., lxxix, 1070.
HILDEBRANDT. Die Prognose und Therapie der Schädelverletzungen durch die modernen Kriegswaffen. Zentralbl. f. Chir., 1906, No. 25; Briefe von der deutschen Ambulanz des Roten Kreuzes in Südafrika. München. med. Wchnschr., 1899, No. 15.
VON HIPPLE. Über die Laparotomie im Kriege. Arch. f. klin. Chir., lxviii, 715.
HOORN. Kriegschirurgische Erfahrungen aus dem russisch-japanischen Kriege nebst einem Anhang über Verwundetenabschub bei den Russen und Japanern. Wien, 1907.
IMBRIACO. Le perdite, morti e feriti nelle guerre moderne. Policlinico prat., 1912, xix, 27.
KAYSER. Über die Veränderung unserer kriegschirurgischen Anschauungen und Aufgaben. Deutsche med. Wchnschr., 1909, No. 24, 1054; Über die Veränderungen unserer kriegschirurgischen Anschauungen und Aufgaben. Vortr. a. d. 80. Vers. Deutsch. Naturf. u. Ärzte zu Köln.
KENDALL. Experiences in the Philippine Islands. Buffalo M. J., 1902, September.
KETTNER. Transport und Unterkunft der Verwundeten und Kranken im russisch-japanischen Kriege. Beitr. z. klin. Chir., liii, 1.
KÖHLER, A. Kriegschirurgie der Feldärtze der Neuzeit. Berlin, 1904; Einige neuere Vorschläge für die Kriegschirurgie. Verhandl. d. freien Verein. d. Chir., Berl., 1907, ii, 380; Geschichte der Kriegschirurgie. Herausg. O. Schjerning.
KÜTTNER. Die Chirurgie des Krieges. Med. Blätter, 1912, No. 6, 61; Zur Behandlung schwerer Schussverletzungen der Lunge mit primärer Naht. Deutsche Ztschr. f. Chir., 1908, xciv, 1; Kriegschirurgische Erfahrungen aus dem südafrikanischen Kriege, 1899, 1900. Beitr. z. klin. Chir., xxviii, 717; Moderne Kriegschirurgie. Vortr. a. d. 84. Vers. Deutsch. Naturf. u. Ärzte in Münster; Über Schusswunden an den Extremitäten. Klin. Jahrb., 1902, p. 145; Moderne Kriegschirurgie. Wien. klin. Wchnschr., 1912, xliv, 551; Kriegschirurgische Erfahrungen aus dem südafrikanischen Kriege, 1899, 1900. Verlag d. Lappschen, Buchhandlung in Tübingen.
LÖNNQUIST. Kriegschirungische Erfahrungen von russisch-japanischen Kriege. St. Petersb. med. Wchnschr., 1905, p. 22.
LÜHE, L. Vorlesungen über Kriegschirurgie. Berlin, 1897.
MAKINS. Some Impressions of Military Surgery in South Africa. Brit. M. J., 1900, i, 344; Diets at the Military Hospitals, Wynberg, Cape Colony. Brit. M. J., p. 484; Notes on the Wounded at Paardeburg, p. 865; Surgical Experiences in South Africa 1899, 1900, London, 1901.
MANTEUFFEL, VON. Über die erste Hilfe auf dem Schlachtfelde. Verhandl. d. deutsch. Gesellsch. f. Chir., 1906, ii 495; Kriegschirurgische Beobachtungen. St. Petersb med. Wchnschr., 1904, No. 38, 409; Die Behandlungen der Gefässverletzungen im Kriege, 1905–6. Arch. f. klin. Chir., lxxxi, 306; Über die ärztliche Tätigkeit auf dem Schlachtfelde in den vorderen Linien. Arch. f. klin. Chir., 1906, lxxx, 711.
MATTHIOLIUS. Sanitätsbericht über die Tätigkeit der Expedition der deutschen Vereine vom Roten Kreuz im Burenkriege. Deutsch. militär. Ztschr., 1900, p. 593.
NIMIER and LAVAL. Traitéments des blessures de guerre. Paris, 1901.
NUGUERA, E. P. Das Heroform in der Kriegschirurgie. Deutsch. militär. Ztschr., 1899, xxviii, 289.
VON OETTINGEN. München. med. Wchnschr., 1906, No. 7, 320; Über die Indikationen beim Schädelschuss im Kriege. Arch. f. klin. Chir., lxxxi, 163–183; Leitfaden der praktischen Kriegschirurgie. Leipzig, 1912; Die Schussverletzungen des Bauches nach Erfahrungen im russisch-japanischen Kriege, 1904–5. Arch. f. klin. Chir., lxxx, 161; Über Bauchchirurgie im Kriege. Verhandl. d. deutsch. Gesellsch. f. Chir., 1906, 167.
PERTHES, G. Über einige Schussverletzungen. Ztschr. f. Chir., lxiii, 75.
VON PEZOLD. Aus Militärärztlichen Berichten vom Kriegsschauplatz im fernen Osten. München. med. Wchnschr., 1905, p. 1202.
POST, J. Kriegsverbandschule. Stuttgart, 1904; Zur Reform des Kriegsverbandwesens. Deutsch. Ztschr. f. Chir., lvi, 147.
RASCHIOFSZKY. Kriegswaffen und Feldsanitätsdienst. Wien, 1907.
RASCHOFSKY–COON. Kriegswaffen und Feldsanitätsdienst. II. Aufl., Wien, 1907.
REYHER, W. Die Infektion der Schussverletzungen. Arch. f. klin. Chir., lxxxviii, 576.
SARLO, E. DE. Il materiale di sutura e di allaccratura in chirurgica di guerra. Giorn. di med. milit., 1912, lx, 6.
SELDOWITSCH. Über Verletzungen durch japanische Geshosse. Russk. Vrach, 1904, No. 34; Arch. f. klin. Chir., lxvii, 219
SCHAEFER. Zur Kriegschirurgie. Verhandl. d. deutsch. Gesellsch. f. Chir., 1906, l, 19.
SCHAEFER, SVENSON, and VON DER OSTEN-SACKEN. Die Wirkungen der japanischen Kriegswaffen im mandschurischen Feldzuge. Arch. f. klin. Chir., lxxxiv, 917, and lxxxix, 915.
SCHLICK. Meine kriegschirurgische Erfahrungen während der chinesischen Wirren im Juni bis Oktober. Deutsche milit. Ztschr., 1901, August.

SENN, N. Medico-Surgical Aspects of the Spanish-American War. J. Am. M. Ass., 1900, p. 379; Modern Treatment of Gunshot Wounds. J. Am. M. Ass., 1898, xxxi, 31; The Returning Army. J. Am. M. Ass., 1898, xxxi, 653; Empyema in Camp George H. Thomas, J. Am. M. Ass., 1898, xxxi, 1497.

SCHJERNING. Die Schussverletzungen durch die modernen Feuerwaffen. Chirurgenkongress, 1902.

SCHJERNING, THÖLE and VOSS. Die Schussverletzungen.

SEYDEL. Lehrbuch der Kriegschirurgie, 1905.

STAHMER. Kriegschirurgische Erfahrungen aus dem südafrikanischen Kriege. München. med. Wchnschr., 1901. p. 409.

STOKES, W. Some Experiences at the Military Hospitals, Movi River, Natal. Brit. M. J., 1900, April 28.

STREHL, H. Erfahrungen auf dem Kriegsschauplatze im Südafrika, 1900. Vortr. im Verein f. wissenschaftl. Heilk. in Königsberg, 1900.

TILMANN. Über Schussverletzungen des Gehirns. Arch. f. klin. Chir., lvii, 608–629.

TINUCANE. General Nerve Shock, Immediate and Remote, after Gunshot and Shell Injuries in the South Africa Campaign. Lancet, Lond., 1900, Sept. 15, p. 807.

TOUBERT. Précis de chirurgie d'armée. Paris, 1900.

TRENTLIN. Kriegschirurgisches aus Japan. München. med. Wchnschr., 1906, 25.

TREVES, F. The Retreat from Spearman's Hill to Chievely. The Relief of Ladysmith. Brit. M. J., 1900, March 24, and April 7; Wounded in the Present War (Boer). Brit. M. J., 1900, p. 1156.

CONTRACTURED PSOAS PARVUS TENDONS

THEIR SIGNIFICANCE AND CLINICAL RELATIONSHIP TO LESIONS OF THE RIGHT ILIAC REGION

BY T. L. MACDONALD, M. D., WASHINGTON, D. C.

THERE is a dearth of literature dealing with contracture of the psoas parvus tendon and its symptomatic resemblance to appendicitis, and yet the ease with which it may be mistaken for chronic or subacute inflammation of the vermiform appendix, the facility with which it may apparently perpetuate post-operative distress in the right iliac region, and our unsuspecting attitude regarding its existence, seem to call for the publication of cases and comment. Doubtless the routine examination for the lesion, when operating in this region, would result in the recognition that it is not an extremely rare affection. The fact that the small psoas consists mainly of tendon, that it lies upon the anterior surface of the large psoas, and that this tendinous portion is bisected by a line drawn from one anterior superior iliac spine to the other, suggests the ease with which one sweep of the forefinger will reveal its presence or absence (Fig. 1). The investigation is simplified because the great psoas has no tendon till it passes beneath Poupart's ligament. It is worthy of remark that while the small psoas tendon normally lies flattened laterally, in the few cases of contracture which I have seen it was flattened anteroposteriorly; as though there were a greater degree of spasm in the median portion of the tendon and its fibers thus elevated as they tend to occupy a position which represents the shortest distance between their origin and insertion. This is apparently corroborated by the fact that the median fibers separate more widely when severed than do the lateral. The tendon presents a rather sharp, cardboard-like edge, well calculated to obstruct the cæcal current, as the bowel may be found lying across this edge, the posterior cæcal surface being projected forward, the distal and proxymal portions of the gut hanging down each side of the tendon, forming the saddle-bag cæcum, as found in the following case (Fig. 2):

CASE 1. Female, age 28, had complained of progressive discomfort in the right inguinal region for several years. In December, 1907, she was brought to the hospital suffering from an acute attack of suppurative appendicitis, so extensive that drainage was employed; there was some subsequent infection of the abdominal wound, otherwise recovery was uneventful.

In 1910 she returned from Ohio complaining of pain, aching, and tenderness in the right inguinal region. Standing or walking, the body inclined forward and slightly to the right, and while in the recumbent posture the right thigh was always flexed (Fig. 3). Constipation was extreme. Interrogation elicited the information that these symptoms though in a less degree, were noticed prior to her operation for appendicitis. They were

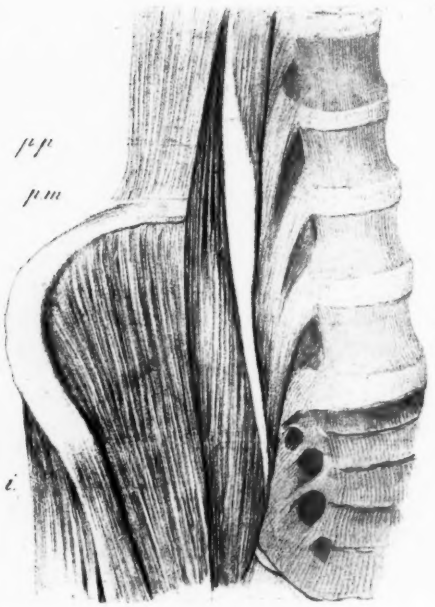


Fig. 1. p.p, psoas parvus; p. m., psoas magnus; i, iliacus.

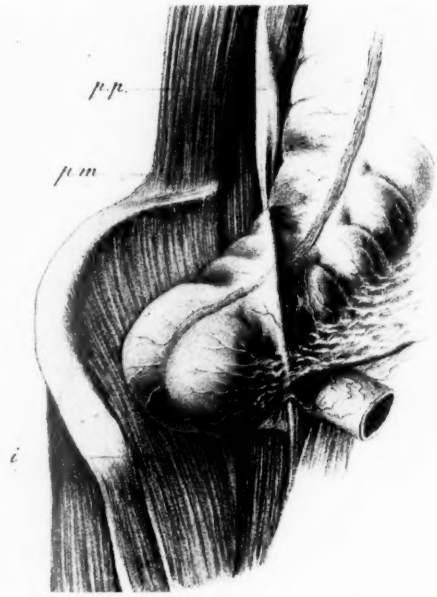


Fig. 2. The saddle-bag cæcum. p.p, psoas parvus, its tendon contractured and damming the cæcal contents; p. m., psoas magnus; i, iliacus. (The appendix had been removed at a previous operation.)

steadily growing worse and she desired relief. Bearing in mind the extent of the suppuration when operated upon previously, the drainage and wound infection, we naturally thought that post-operative adhesions caused her complaints. Consequently the abdomen was reopened, the gloved forefinger introduced and swept along the margins of the wound for adhesions, but there were none. The initial movement of the finger brought it in contact with the dense psoas tendon, its sharp glistening edge directed anteriorly and pressing into the under surface of the cæcum, practically occluding its lumen, and forming a dam over which the contents of the gut made its way with difficulty.

The peritoneum overlying the contracture was cut through parallel with the tendon, which was then cut transversely, separating widely, with a snapping noise. Coincident with this, flexion of the thigh — which was maintained in spite of the anæsthesia — was abolished and the right leg assumed a position similar to the other. The peritoneum was sutured over the severed tendon and the abdominal wound closed. Recovery and prompt subsidence of symptoms.

To this patient a pleasing and somewhat surprising feature of her convalescence was the discovery that her right thigh was no longer flexed, and that, contrary to the post-operative rule, her bowels moved without assistance, even while lying in bed (Fig. 4). This case is not the most typical, but illustrates the tendency to attribute right inguinal symptoms to post-operative adhesions. And it is quite possible that abnormal cæcal membranes, mobility, and kinks, which presumably have been overlooked during operation, have sometimes been unjustly blamed for symptoms which persist after operations for appendicitis and perhaps tubal and ovarian disease as well.

Illuminative of this, and also showing the tendency to put unjust blame upon the previous operation, is the following:

Case 2. Mrs. D., age 39. Multipara. Somewhat neurotic. Had been operated upon by a competent surgeon, a year ago, for bilateral inguinal hernia, and through the inguinal incisions he shortened the round ligaments, for retroversion. Since convalescence she has suffered continuously with pelvic distress, especially in the ovarian regions and at menstruation, during which morphine had been employed habitually. She also complained

of discomfort in standing or sitting erect or lying with the thighs extended. There was bilateral pelvic tenderness on palpation, also tenderness over the appendix; uterus in the anterior position. The patient, her family, and family physician condemned the previous operation and held it responsible for all the subsequent symptoms. We contended against this, first, on general principles, and second, because tubo-ovarian as well as appendiceal disease seemed distinctly manifest. Attention was called also to the probability of psoas tendon contracture. The abdomen was opened in the median line, the uterus shown, to the doubting family physician, in good position. There was a small ovarian cyst on the right side, which was resected, a small tubal cyst on the left; both ovaries hung too low in the pelvis; their ligaments were shortened. The vermiform appendix was removed, being markedly inflamed, bent upon itself and adherent; Jackson's membrane was present in a mild degree. Both psoas parvus tendons were contractured. The overlying peritoneum was incised and the tendons cut across. Convalescence satisfactory, with immediate relief of pain, soreness, and thigh flexion.

I am inclined to the belief that it is well to examine for psoas parvus contracture when operating for other lesions in this area.

The existence of thigh flexion and even pain down the thigh, before operation, cannot be depended upon to draw our attention away from disease of the appendix because they are so frequently associated with it.

The following is the variety which will probably be seen most commonly:

CASE 3. Female, age 24; nurse; referred to the surgical department suffering with appendicitis. No gastric or febrile symptoms, but localized pain, tenderness, and muscular rigidity. There was a past history of right-sided distress gradually increasing in severity. The abdomen was opened over the appendix which was found clubbed and moderately engorged, but not sufficiently inflamed to account for the symptoms. As the forefinger was introduced and swept inward to hook up the cæcum and appendix it encountered the tense psoas tendon. The corresponding tendon of the left side was examined for comparison and found to be normal. The appendix was removed, then the peritoneum peeled off from the outer edge of the abdominal incision — and turned up from the glistening tendon — much as one might expose the ureter. The tendon was severed, evoking a sharp, snapping sound, and separating an inch and one-half. Recovery with prompt subsidence of symptoms.

CASES 4 and 5 are so nearly identical with the one preceding that narration in detail may be omitted. Case 5 differed only in the presence of a moderate sized tubo-ovarian mass which was removed with the appendix through a McBurney incision — not the most convenient method, but still quite feasible.

Fig. 3. The characteristic thigh flexion. Before operation.

Fig. 4. Prompt abolition of thigh flexion. After operation.

The second case is the only one among these which was not regarded as appendicitis or appendicular sequela. When the median incision is employed, as in this instance, it becomes necessary, of course, to open the peritoneum resting upon the tendon, rather than to expose the tendon by peeling up the peritoneum from the wound edge.

In the first case the contracture existed prior to and coincident with the suppurative appendicitis, but was obscured by adherent intestines and omentum; and, even if discovered, no attempt should have been made to deal with it at that time.

SUMMARY

1. The pre-operative flexion of the right thigh is so frequently a symptom of inflammation of the vermiform appendix that it seems to confirm this diagnosis.

2. In the cases of moderate contracture complete thigh extension may be possible but painful. Restriction is definite.

3. In the suppurative cases of appendicitis the contractured tendon may readily be overlooked because of the importance of terminating the operation at the earliest moment, of indulging in the least possible intra-abdominal manipulation, and because bowel and omental adhesions supervene.

4. It may not be significant, but in each case the psoas parvus tendon on the other side was examined and found normal except in Case 2.

5. The cardboard-like edge of the shortened tendon is capable of damming — to a most troublesome degree — the cæcal current, the relief of constipation, after tenotomy, being quite noteworthy, even while the patient is lying in bed.

6. At present the stripping up of the peritoneum from the outer edge of the abdominal wound, as though to expose the ureter, seems satisfactory and feasible for exposing the tendon for tenotomy, when the abdomen is opened through the oblique incision.

7. Prompt relief of the symptoms may be expected after complete tenotomy.

8. In the post-operative cases the leaning attitude of the patient may well suggest adhesions.

9. The persistence of thigh flexion under anæsthesia is characteristic.

10. All of these patients were inclined to be neurotic.

11. It now seems somewhat strange that in a hospital service of eighteen years similar cases have not been encountered before, which suggests that it is wise to exclude this lesion when operating in the lower abdomen.

12. The unsuspecting attitude of both medical attendants and surgeon is emphasized by the fact that the only instance in this short series wherein the contracture was even suggested before operation was in Case 2, which was the last one seen.

SARCOMA OF THE ROUND LIGAMENT OF THE UTERUS[1]

By FRED J. TAUSSIG, M. D., Saint Louis
From the Department of Gynecology and Obstetrics, Washington University Hospital

TEN years have elapsed since Emanuel gave his thorough review of tumors of the round ligament of the uterus. Including his own, Emanuel was able to collect 80 cases altogether. The observation of a very interesting and unusual type of round-ligament tumor, a spindle-celled sarcoma, induced me to review the literature of the last ten years to see what light, if any, the additional cases recorded during that time might throw upon the pathology and symptomatology of this condition. Without going exhaustively into the literature, I was able to collect 61 additional reports, including my own, making a total of 141 round-ligament tumors. A number of these cases are doubtless never reported. Thus I recall assisting the late Dr. A. C. Bernays in an operation in the year 1899 at the St. Louis Female Hospital upon a negress who had a round-ligament tumor the size of a child's head lying in the left inguinal canal. Microscopic sections of the tumor made by Dr. Carl Fisch revealed what he termed a fibromyxoma. Macroscopically the tumor resembled a fibromyoma.

The report of my own case is as follows:

Mrs. M. G., 44, married; entered the hospital October 27, 1913, because of a protrusion from the vagina, associated with backache and soreness in the lower abdomen.

Family history. Negative.

Past history. General health good; very nervous at menstrual periods.

Menstrual history. Began at 13; twenty-eight-day type, lasts three to four days, profuse, regular, considerable pain; last menstruation October 18th, three days.

Married nineteen years, had seven children; oldest seventeen years, youngest four years; three miscarriages — last one five years ago; no instrumental

[1] Read before the Washington University Medical Society, March 9, 1914.

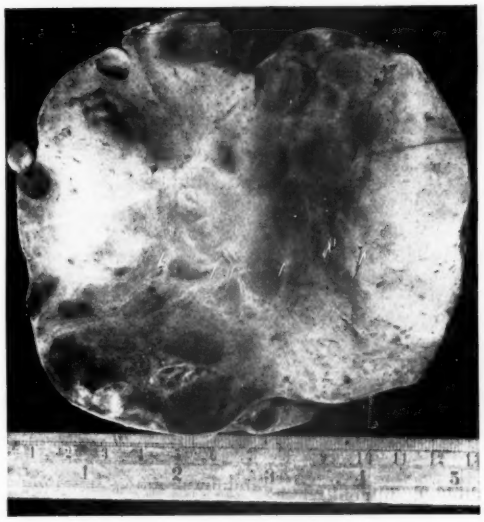


Fig. 1. Tumor cut along its greater diameter showing lobulated structure, telangiectatic areas, and several small cysts.

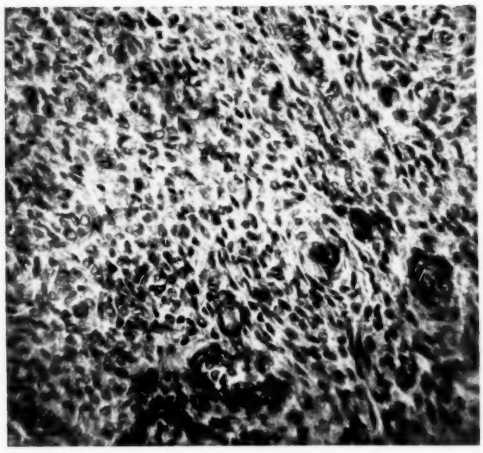


Fig. 2. High power section from sarcomatous node at base of tumor showing character of cells and well-formed blood supply.

deliveries; was torn with first child; no trouble after the miscarriages.

After the birth of her fifth child, ten years ago, she noticed some dragging in the pelvis and a slight vaginal protrusion. This became more pronounced after the two succeeding confinements. About one year ago the patient says she felt something come down and protrude from the vulva. Finally about a month ago the protruding mass was so large as to interfere with walking. When off her feet the mass stayed in the pelvis. There had been some backache and soreness in lower abdomen.

Bowels regular; no frequency or burning on urination; no history of gonorrhœa or lues; sleeps well; good appetite.

Physical examination. Well developed, well nourished adult. Skin of good color, warm, moist. Left lobe of thyroid enlarged to about 6 x 4 cm.; feels boggy, not fluctuating, not tender. Systolic murmur, loud, blowing; loudest at apex and transmitted to axilla. Murmur also heard in vessels of neck. Pulse 70 to 80, regular in force and rhythm.

Abdomen. Good layer of fat, flabby. A mass outlined in lower abdomen extending to within one inch of umbilicus, ovoid, hard, movable, somewhat to the right side.

On vaginal inspection there is a rather free vaginal discharge, pronounced cystocele, and some rectocele. On bearing down, cervix comes to edge of vulva. At other times it lies about one and one-half inches within the vagina, enlarged, hard, movable from side to side but not backward. Continuous with it posteriorly and to the left of the median line lies the body of the uterus, crowded down into the cul-de-sac by a large ovoid mass lying to the right and above it. This mass is slightly irregular in contour and is movable, but on pulling upward strongly pain is elicited. The right tube and ovary could not be palpated distinct from the mass; the left tube and ovary could be felt and were apparently normal.

Blood count: 5,120,000 red; 8,420 white; 90 per cent Hg.

Blood-pressure: 130 systolic; 90 diastolic.

Diagnosis. Right-sided ovarian tumor (fibroid or pseudomucinous cyst); cystocele; relaxed floor; goiter.

Operation. The laparotomy on October 30th, under nitrous oxide-ether anæsthesia, revealed a somewhat nodular mass the size of a grape-fruit adherent to the omentum, ileum, and abdominal wall. No ascites was present. The adhesions between the loop of ileum and the tumor were extensive and firm, so that they had to be cut bit by bit. When the tumor was freed from these attachments, the uterus, tubes, and ovaries could be seen lying beneath it, free of all adhesions and perfectly normal except for a slight thickening and retroversion of the uterus. The left round ligament was normal in its course and proportions. The right round ligament at its uterine end was slightly thickened, and at a distance of about two inches from the uterine horn was lost in the tissue of the tumor itself. The round ligament could again be distinguished at its entrance into the inguinal canal. The tumor had a broad-pedicled attachment and was apparently entirely covered by peritoneum. Three or four nodules the size of a bean lay loosely attached to the main tumor around its pedicle. They resembled in all respects the tissue of the tumor. The tumor was readily

lifted up, clamped off, and removed. In view of the apparent malignancy of the tumor, it was decided to remove the right adnexa and the body of the uterus. The cervix was then fixed to the fascia and muscle of the abdominal wall. It was thought best to leave the perineoplastic for a later operation if found necessary. Exploration of the lymphatic glands, intestines, liver, kidney, and stomach revealed no metastases anywhere in the abdomen. Closure of incision with tier sutures.

Beyond considerable distress with gas pains the patient made an uneventful recovery. A re-examination on December 4th showed no tumor mass palpable in the pelvis. The cystocele was less pronounced, but still present.

The specimen removed (Fig. 1) measured 12½ by 11½ by 9 cms., was ovoid, somewhat lobulated in shape, and contained a few loosely attached nodules the size of a bean. Two of these nodules were put in Zenker's fluid at once. The remainder of the specimen was fixed in formalin. The whole tumor had a jelly-like consistency. It was studded with numerous cysts containing serous fluid and varying in size from a pea to a walnut. On section it showed a lobulated structure and a smooth cream or butter color. At the base of the tumor could be seen a small area of fibrous connective tissue which appeared to be the remnant of the round ligament.

Microscopic sections taken from many portions of the tumor confirmed the diagnosis of a spindle-celled sarcoma. There was very little connective tissue as a reticulum for the tumor-cells. The cells themselves were fairly regular in shape, being either ovoid or spindle-shaped, and had deeply staining nuclei. The blood supply was unusually well developed (Fig. 2) and indicated the slow-growing character of the tumor. The cysts proved to be of lymphatic origin, as shown by their endothelial lining and structure. No evidence of epithelial structures of any sort could be seen. This is of importance in view of the frequency with which they have been found in round-ligament tumors.

The covering of the tumor is shown in Fig. 3 to be a serous membrane identical in structure with the peritoneum. In this section can also be seen a few very small cystic formations in the tumor itself.

That the tumor actually sprang from the tissues in or around the round ligament is substantiated by the microscopic picture shown in Fig. 4. Here we see the fibromuscular tissue of the ligament at the base of the tumor actually losing itself in the nests of sarcomatous tissue. Sections stained according to Van Gieson showed that a large proportion of this band was composed of bundles of unstriated muscle-tissue.

General considerations. The sixty-one additional cases exclusive of the above published since 1903 are those of Aichel, Alfieri, Albert, Amann (2), Baudet, Blisner, Booin, Bortkiewitsch, Chevassu, Colloca, Davidson, Finsterer, Frankl, Friedrich, Frigyesi, Fukada, Gottschalk, Hirst and Knipe (3), Hulst, Kaiser, Klemens (7), Kolb, Lecene, Lewis (2), Lubentz-Liaschenka (3), Maly, Mantelli, Morestin, Muenchmeyer, Nebesky (2), Schauenstein, Schlank, Soli, Spencer, Steidl, Szili, Tietmeyer, Venus, Weishaupt (4), Winckel, Wiener, Wood, Zeili, Zurmuehlen. This makes a total of 132 round-ligament tumors for our consideration.

Age of patients. Since most of these tumors resemble, in point of origin, fibroids of the uterus, it is not surprising to find that a large majority of them appear in patients between thirty and fifty years of age. Winckel's tumor, however, was found in a woman of seventy-six and Aichel's was observed in a new-born child. Between twenty and thirty and between fifty and seventy years they occur with less frequency.

Location and size. Tumors may spring from any portion of the round ligament; in fact, quite a number have been found to spring from the ovarian ligament, which may be considered as embryologically identical with the round ligament. The last named group I have, however, not included in this review. Emanuel found that out of his 80 cases only 20 developed intra-abdominally, the remaining three-fourths being found either in the inguinal canal or in the labial fold. This preponderance of the extra-abdominal site has been corroborated by the cases reported up to the present time. I found 18 intra-abdominal and 30 extra-abdominal, making the total proportion 38 intra-abdominal and 90 extra-abdominal. The intra-abdominal tumors arise frequently from that portion of the ligament nearest the uterus and usually grow outward into the peritoneal cavity, so that they present the appearance of a pedicled tumor attached to the ligament. Such was the condition in our own case. At times, however, they grow into the broad ligament, or, if situated near the internal inguinal ring, they may grow subperitoneally. A multiplicity of tumors was noted by Winckel, Amann, and Davidson. In Davidson's case both ligaments were studded with many tumors. In one of Cullen's cases, after removal of a tumor on one

Fig. 3. Section from margin of the tumor showing peritoneal covering and two small cysts.

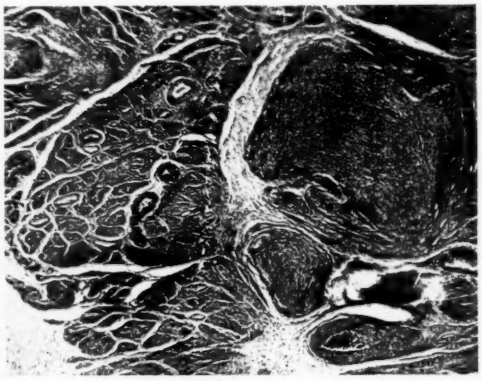


Fig. 4. Section from the base of the tumor showing tumor nests to the right and bundles of unstriated muscle-fibers to the left.

side, a second one formed in the other round ligament.

The right side was found by Emanuel to be three or four times more often the site of such a tumor than the left side. In 37 of the additional cases in which data were obtainable the proportion was 20 right-sided to 17 left-sided tumors, so that the preponderance of right-sided growths seems questionable.

The size of the tumors varied greatly, the smallest being but slightly greater than the diameter of the round ligament, whereas the largest extended up to the border of the ribs. On the whole, the extraperitoneal ones are larger than the intraperitoneal. Those tumors that begin in the inguinal canal often dissect their way between the layers of the abdominal wall, or, if lying at or about the external ring, project into the labial fold and are then classed as tumors of the vulva. It is more than likely that practically all fibroid tumors of this region have their origin in the round ligament.

Since most of these tumors are fibromyomata, the shape is usually round or oval, but occasionally they are multilocular. In my own case the tumor had numerous small nodules upon its surface. Owing to the frequency of cystic and telangiectatic conditions in these round-ligament tumors, it is not surprising that a certain percentage of them have a semisolid or even fluctuating consistency. The rule is, however, that the consistency is firm.

The symptoms produced are very slight, so that many of the patients state that they felt the tumor for many years but that it gave them no special inconvenience. Intra-abdominal tumors usually go a long time undetected and give rise to the same symptoms as subserous fibromyomata or solid ovarian tumors. If the tumors are not very large, so that the ovaries can still be palpated, the differential diagnosis can at times be made. Ordinarily this is impossible, and in very few instances was the correct diagnosis of an intra-abdominal round-ligament tumor made.

The extra-abdominal tumors are usually mistaken for herniæ in the early stages of growth. Later, when the tumor becomes larger, they may give rise to pressure symptoms, pains radiating down the leg, and a dragging sensation. In general instances the tumors were associated with inguinal herniæ of varying size. The differentiation from irreducible omental hernial masses and from hydrocele muliebrum is often attended with considerable difficulty. In Klemens' seven cases of extra-abdominal tumors the correct

TABLE I. SARCOMA OF THE ROUND LIGAMENT

Name and Reference	Microscopic Diagnosis	Age	Symptoms	Location	Size	Shape	Consistency	Operation	Result
SAENGER. Arch. f. Gynäk., 1883, xxi	Fibromyosarcoma	22	Five years ago noticed tumor. Growth more rapid since pregnancy 14 months ago	Right inguinal canal	21x18 cms.	Wedge-shaped	Firm	Removal difficult; hæmorrhage	Died on second day
FUERST. Arch. f. Gynäk., 1886, xxvii	Fibrosarcoma	38	Six years ago noticed growth in left inguinal canal. Some ulceration and sensitiveness recently	Left labium majus	Hen's egg	Cylindrical	Hard	Removal easy	Recovery
WEBER. Monatschr. f. Geburtsh. u. Gynäk., 1899, ix	Myosarcoma	25	Three years ago felt a tumor in inguinal canal	Left inguinal canal	Child's head	Round but nodular	Semisolid	Removal easy	Recovery
FRIGYESI. Zentralbl. f. Gynäk., 1902, xxvi, p. 831	Fibrosarcoma	43	Pains in lower abdomen for 2½ years. Rapid growth of abdomen for last 6 months. Ascites	Right abdominal portion	Small child's head	Oval; smooth	Hard	Removal easy	Recovery
MALY. Arch. f. Gynäk., 1905, lxxvi	Myosarcoma	36	Growth for 16 years, very slow, recently more rapid	Right labium majus	Goose-egg	Ovoid; smooth	Elastic; pseudo-fluctuating	Removal easy	Recovery
TAUSSIG.	Spindle-celled sarcoma	44	For two years pressure against the bladder	Right abdominal portion	Grapefruit	Oval; numerous nodules and lobes	Semisolid	Removal easy	Recovery

diagnosis was made only three times before operation.

It has been stated that the wearing of a truss for inguinal hernia was a predisposing factor, but it is more than likely that the supposed hernia was in reality a beginning tumor formation and that the pressure of the truss naturally irritated it to more rapid growth. Pregnancy, which causes such a marked hypertrophy of the round ligaments, would naturally be expected to stimulate such tumors to active increase in size. Such indeed is the case as shown by the cases of Hirst, Kolb, Nebesky, and Mantelli. It may become necessary to remove such a tumor during pregnancy, but ordinarily it is best to wait until after the puerperium.

The most interesting feature of these tumors is their varied pathology. In 135 out of the 141 tumors a statement was given as to the nature of the neoplasm. Seventy-nine of them belonged to the group of fibromyomata, although in some instances (19), they were termed simply fibromata, and in other instances (14) were classified as myomata. In 19 tumors there was only a thin shell of fibromuscular tissue surrounding a cyst, and three of these cysts contained blood and were classified as hæmatomata. Occasionally the cysts were multilocular. One unique case is recorded by Fischer of a dermoid cyst springing from the left round ligament.

The most striking fact in the pathology of round-ligament tumors is the comparative frequency of adenomyomata. Cullen found that out of a total of 1283 cases of myoma of the uterus examined at Johns Hopkins Hospital between 1893 and 1906, 73, or 5.7 per cent, were adenomyomata. The proportion among round-ligament tumors, on the other hand, was 30 out of a total of 135, or 22 per cent; that is to say, they are relatively four times as frequent at this site. This may perhaps be due to the close relationship between the wolffian duct and the nephrogenic band extending almost the entire length of the embryo. It is from the latter, according to Kermauner's latest investigations, that the round ligament takes its origin. While Cullen interprets his case of round-ligament adenomyoma as springing from the müllerian ducts, his arguments are not very convincing. On the other hand, the arguments pointing to the wolffian origin of these tumors is very considerable. Chevassu found a distinct kidney glomerulus in his adenomyomatous tumor. Robert Meyer could trace in a considerable number of round ligaments of the new-born an epithelial-lined duct corresponding to the wolffian duct. Frankl's case

of a small adenomyoma of the abdominal portion of the round ligament was associated with a uterus bicornis unicollis. Venus found an epithelial duct in the normal portion of the round ligament in which was contained an adenomyomatous tumor. Almost all those who have made careful microscopic studies of their tumors lean toward the interpretation of a wolffian origin.

In view of the rarity of sarcomata and the fact that my own tumor was of this type, I have thought it worth while to tabulate the six cases of this kind thus far recorded. The case mentioned by Hirst and Knipe contains no details as to histopathology or other important clinical facts. I could not obtain accurate information concerning the large sarcoma of the round ligament reported by Fukada.[1] That leaves only the cases of Saenger, Fuerst, Weber, Frigyesi, and Maly in addition to my own. Details of these cases will be found in the accompanying table.

In general these round-ligament sarcomata may be described as slow-growing and but slightly malignant clinically. Metastases are nowhere described, nor was I able to find any record of recurrences after operation. The tumors do not seem to grow to any unusual size and are most often extra-abdominal. Only one post-operative death occurred and that was in the first recorded case thirty years ago. In all but my own case the tumors were apparently malignant degenerations of a benign neoplasm, a fibromyoma. Microscopic examination of the tumor in my case gave no evidence of any previously existing benign tumor.

LITERATURE

ALBERT. Zentralbl. f. Gynäk., 1905, No. 14.
ALFIERI. Zentralbl. f. Gynäk., 1910, 157.
AMANN. Cited by Von Zurmuehlen, Zentralbl. f. Gynäk., 1910, 877.
AICHEL. Zentralbl. f. Gynäk., 1912, 57.
BAUDET. Toulouse méd., 1909, 296.
BLISNER. Zentralbl. f. Gynäk., 1910, 117.
BLUHM. Arch. f. Gynäk., lv, pt. 3.
BOOIN. Hygiea, 1912, 440.
BORTKIEWITSCH. Arch. f. Gynäk., 1914, ci, 633.
CHEVASSU. Rev. de gynéc. et de chir. abdom., Par., 1910, 537.
CUSHING. Pac. M. & S. J., 1887, March.
COLLOCA. Ginecologia, 1908, v, 724.
EMANUEL. Ztschr. f. Geburtsh. u. Gynäk., 1903, xlviii, 383.
DAVIDSON. Zentralbl. f. Gynäk., 1912, 1094.
FINSTERER. Beitr. z. klin. Chir., 1908, lix, 247.
FRANKL. Gynäk. Rundschau, 1912, 541.
FRIEDRICH. Zentralbl. f. Gynäk., 1913, 1269.
FRIGYESI. Zentralbl. f. Gynäk., 1902, 831.
FUERST. Arch. f. Gynäk., 1886, xxvii, pt. 1.
FUKADA. Sei-i-Kwai, Med. J., Tokio, 1912, xxxi, July 10.
GOTTSCHALK. Zentralbl. f. Gynäk., 1908, 951.
HIRST and KNIPE. Surg., Gynec. & Obst., 1907, iv, 715.
HULST. Zentralbl. f. Gynäk., 1905, No. 10.
KAISER. Zentralbl. f. Gynäk., 1908, 193.
KERMAUNER. Zentralbl. f. Gynäk., 1912.
KLEMENS. Beitr. z. klin. Chir., 1910, lxvii, 293.
KOLB. Gynäk. Rundschau, 1910, iv, 782.
LECÉNE. Ann. d. gynéc. et d'obst., 1909, vi, 734.
LEWIS. Am. J. Obst., N. Y., 1903, xlviii, 198.
LUBENTZ-LIASCHENKA. Drei Tumoren d. lig. rot., Zürich, 1910.
MALY. Arch. f. Gynäk., 1905, lxxvi, 175.
MANTELLI. Ginecologia mod., Genova, 1909, ii, 369.
MORESTIN. Rev. de gynec., 1905, No. 2.
MUENCHMEYER. Zentralbl. f. Gynäk., 1910, 12.
NEBESKY. Monatschr. f. Geburtsh. u. Gynäk., 1903, xvii, 441.
SAENGER. Arch. f. Gynäk., 1883, xxi.
SPENCER. J. Obst. & Gynec., Brit. Emp., 1903.
SCHLANK. Przegl. lék, Krakow, 1912, li, 343.
SOLI. Med. Italiani Napoli, 1912, x, 412.
SCHAUENSTEIN. Wien. klin. Wchnschr., 1905, No. 8, 463.
STEIDL. Ztschr. f. Geburtsh. u. Gynäk., 1913, lxxiv, 396.
SZILI. Monatschr. f. Geburtsh. u. Gynäk., 1902, xvi, 979.
TADDEI. Clin. Chir., Milano, 1910, xviii, 1828.
TIETMEYER. Cited by Bortkiewitsch.
VENUS. Zentralbl. f. Gynäk., 1911, 525.
WEBER. Monatschr. f. Geburtsh. u. Gynäk., 1899, ix, 598
WEISHAUPT. Arch. f. Gynäk., 1913, ic, 491.
VON WINCKEL. Cited by von Zurmuehlen.
WIENER. Zentralbl. f. Gynäk., 1908, 797.
WOOD. Proc. N. Y. Path. Soc., 1909, viii, 148.
ZEILI. Cited by von Zurmuehlen.
VON ZURMUEHLEN. Zentralbl. f. Gynäk., 1910, 877.

[1] Sei-i-kwai M. J., Tokio, 1912, xxxi, No. 7.

DEPARTMENT OF TECHNIQUE

A PROCEDURE FOR THE REPAIR OF ACCIDENTAL INJURIES TO THE RECTUM[1]

By CHAS. GORDON HEYD, B. A., M. D., New York City
Lecturer in Surgery in the New York Post-Graduate Medical School and Hospital

IT sometimes happens that the rectum is injured during the course of a pelvic operation. That this accident is by no means an infrequent complication of the extensive operations for radical extirpation of the uterus and adnexa for uterine carcinoma is apparent from the published reports of Bumm, Sigwart, Schauta, and others. The wide parametrical dissection and the desire to remove as much of the upper vagina as possible renders the anterior rectal wall particularly exposed to injury. During the excision of the uterus with vagina, the anterior rectal wall is pulled upwards and forwards — not unlike a cone — and as the incision frees the mass, the apex of the rectal cone is "cut off," leaving an elliptical defect in the anterior rectal wall. Closure of a hole in the rectum in this location is a matter of technical difficulty. First, the injury is at the lowest portion of the pelvis and practically inaccessible for accurate suture work. Secondly, the rectum in this position is relatively fixed and not flaccid. Thirdly, it is difficult to approximate the peritoneal surfaces over the defect.

It was our misfortune during the course of a Wertheim operation to injure the rectum in the above-described manner.

Case 1. M. G. (service of Dr. Geo. Gray Ward, Jr.), Age 33, entered the New York Post-Graduate Hospital on May 22, 1913, complaining of "pain on her left side," with "excessive bleeding." A diagnosis of carcinoma uteri was made and a radical operation advised. On May the 27th a typical Wertheim was performed. Considerable difficulty was experienced in separating the rectum on the left side, and in placing the Sigwart clamp a portion of the anterior rectal wall was grasped. When the uterus and parametria were extirpated there was an elliptical defect in the anterior rectal wall low down behind the posterior vaginal flap. An attempt was made to close the rectal hiatus after the ordinary method of enterorrhaphy. This was unsuccessful, the sutures tearing out and a peritoneal approximation being extremely questionable. To overcome this difficulty recourse was had to the following technique, which is simply a modified application of the well known and widely used "tube technique" for sigmoidorectal anastomosis, as described by Gibson and Balfour. Seriatim the steps are as follows:

First step. A colon tube is introduced into the anus and passed up the rectum to a point one inch above the injury (Fig. 1). Through the anterior rectal wall and the portion of tube above the injury a transfixion suture of number two chromic gut is passed which firmly anchors the tube to the upper portion of the anterior wall.

Second step. The peritoneum on each side of the defect and parallel with the rectum is incised for a distance of about two and a half inches. By this manœuvre the upper rectum becomes mobilized, after the manner of Kocher for mobilizing the duodenum (Fig. 2).

Third step. By gentle traction on the tube protruding through the anus the two lips of the rectal defect are brought together and approximated by three or four interrupted mattress sutures (Fig. 2).

Fourth step. Two Allis clamps, one on each side, are placed about one-half to three-fourths inch below the suture line for the purpose of fixing the lower segment (Fig. 3). Traction is made upon the tube and as a result the upper segment of the anterior rectal wall is "telescoped" into the lower rectal segment. There is thus produced an artificial intussusception of the anterior rectal wall. The original defect or injury is carried down into the lower bowel and by the rolling in of the anterior rectal wall a peritoneal approximation is assured (Figs. 3 and 4).

Fifth step. A right-angle Cushing suture of Pagenstecher thread is passed along the site of peritoneal contact (Fig. 3), completing the repair of the rectum. The lateral peritoneal defects are closed and the tube sutured to the anal margin with silkworm gut, thereby making gentle but firm traction on the upper rectal segment.

The post-operative conduct of the rectal condition was as follows: The tube was removed at

[1] From the Department of Gynecology in the New York Post-Graduate Medical School and Hospital, Service of Dr. Geo. Gray Ward, Jr.

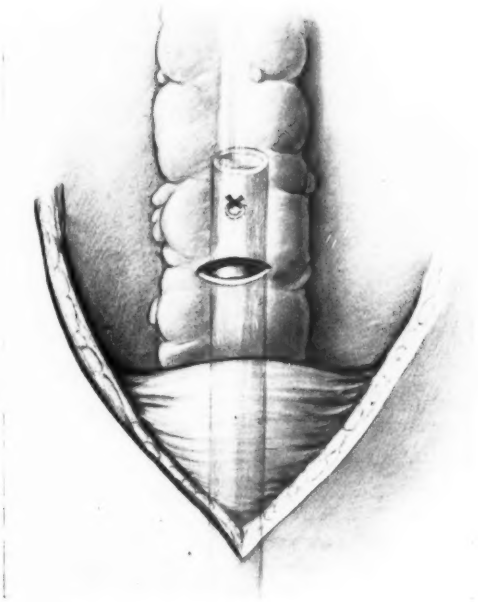


Fig. 1. Injury to rectal wall, tube passed one inch above injury and held *in situ* by transfixion suture.

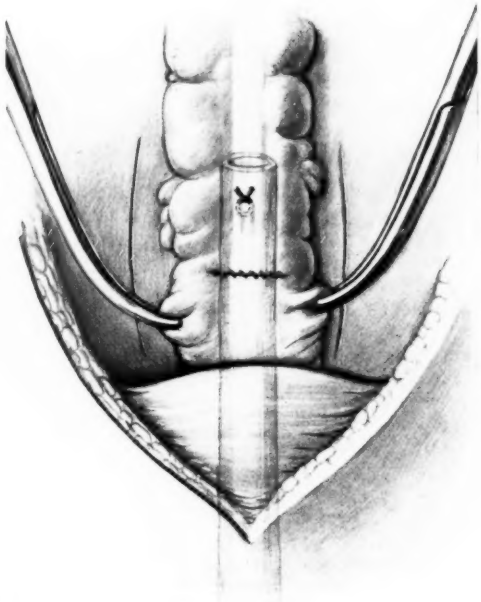


Fig. 2. Transfixion suture passed. Traction on tube approximates the two lips of rectal defect. Lateral incisions through peritoneum for mobilization of upper rectum. Two Allis clamps on lower segment to keep it taut.

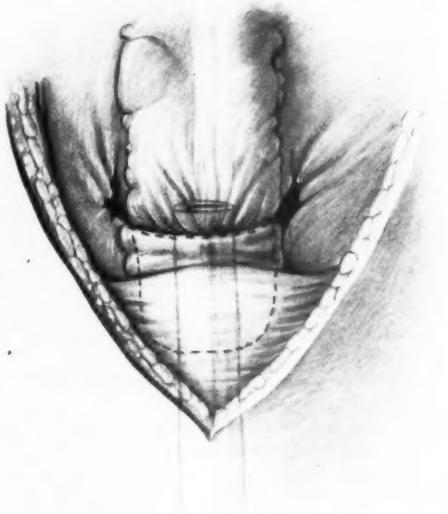
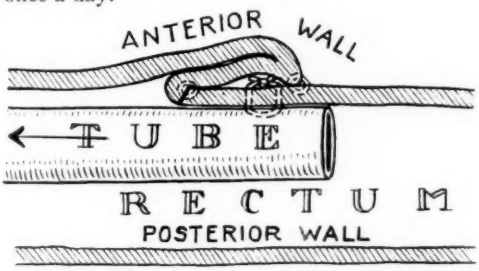


Fig. 3. Upon traction on tube upper segment telescoped into lower. Right-angle Cushing suture—approximating peritoneum.

the end of five days and the patient then given milk of magnesia (four ccm.) every hour for six doses. This was repeated on the sixth day and on the morning of the seventh day the patient had a normal evacuation. No enemata were given during the time the tube was *in situ*. Gases and fluid stool were intermittently discharged through the tube. From the time the tube was removed the patient had no rectal disturbance of any kind either subjectively or objectively and the bowels moved on an average once a day.



It is worth recording that before recourse was had to this method of closure the ordinary method was attempted but the traction upon the sutures was so great and their insertion so inaccurate and insecure that the result would have been very dubious. However, by adopting this simple device it was surprising to see how easily and securely the closure was effected.

We have found the above technique very useful in closing other forms of accidental injuries to the rectum. In a case of morcellation of a fibroid uterus, as a preliminary measure, the paravaginal incisions of Schuchardt were made and the left incision accidentally opened the rectum rather high up. From the peculiar antero-lateral position of the injury it offered considerable difficulty to the ordinary method of closure, but could, however, have been so repaired. The injury was readily closed by the adoption of the above technique. Again, in doing the denudation, preliminary to a perineorrhaphy, the anterior rectal wall, about two inches above the anus, was incised. The defect was readily closed by the application of the above technique with no post-operative fæcal leakage into the perineum.

CONCLUSIONS

1. The splint-like action of the tube is a decided advantage — holding the suture line intact.

2. The induction of a partial intussusception allows accuracy of sutures and approximates similar surfaces.

3. The separation of the two suture-lines by intermediate normal tissue insures against leakage.

4. The technique is easy of application and converts a difficult complication into one that can be repaired with comparative ease and effectiveness.

ON THE TECHNIQUE OF INTRATHORACIC OPERATIONS

By ALEXIS CARREL, M. D., New York City
(From the Laboratories of the Rockefeller Institute for Medical Research, New York)

ALTHOUGH the technique of intrathoracic surgery has been very much improved during the last few years, complications still often follow upon operations on the lungs, the œsophagus, and the heart. For this reason the technical details by means of which intrathoracic operations may be rendered more safe must be worked out. The purpose of this paper is to describe the methods by which the occurrence of pleurisy and of air emboli of the coronary arteries can be prevented.

It is probable that the development of pleurisy is always due to infection or irritation produced by the handling of the pleura with sponges or instruments, by the contact of the blood or by the germs of the air. Most experimenters and surgeons in their operations on the pleura employ the same technique which is used in abdominal surgery. They do not realize that the pleura is very much more liable to infection than the peritoneum and that the mechanical irritation, as well as certain factors of infection, such as the atmospheric germs, are possibly able to produce dangerous complications. Several years ago I read a paper before the members of this Society, in which that question was already investigated and in which the details of a technique for the prevention of these mild but very dangerous infections were described. At that time great care was taken in handling the intrathoracic organs, in sponging and walling off the operating field with gauze, and in protecting the pleura from the various factors which bring about irritation and infection. As soon as the thoracic cavity was opened the lungs were covered with fine silk compresses impregnated with vaseline. The silk tissue acted as a thin and almost impermeable membrane which protected the pleura without irritating it and permitted a very efficient walling off of the operating field to be effected. At the same time it prevented the evaporation and the desiccation of the surface. Of twelve animals operated at that time all twelve recovered. Nevertheless, after more complicated operations, such as the patching of the vena cava, the grafting of vessels onto the heart, some simultaneous operations on the heart and descending aorta, it was observed, when a large exposure of the thoracic cavity was rendered necessary, that serofibrinous or purulent pleurisy was eventually present. In 28 operations performed these complications occurred 7 times.

Although these experiments were made a long time ago, it appears that the technique for the prevention of pleurisy has not been further developed as yet. Both American and European surgeons are still describing more or less complicated methods for the drainage of the pleura. This evidently shows that pleurisy is still an ordinary complication accompanying intrathoracic operations. For this reason I have again attempted to ascertain whether in experimental operations this complication could be entirely avoided.

The use of Japanese silk towels impregnated with vaseline had already in a large measure diminished the danger of the occurrence of pleurisy; but it was nevertheless probable that the silk membrane did not sufficiently protect the remoter parts of the pleural cavity. Moreover, when hæmorrhage occurred the blood flowed along the greased surface of the pad and accumulated in the lower part of the thoracic cavity. For this reason the technique had to be modified, and this was effected in the following manner: The operating field was walled off by two kinds of towels. The first kind was made of Japanese silk which had been previously boiled in water, dried and sterilized in the autoclave, like ordinary pieces of dressing. The second kind was composed of absorbent cotton and of black Japanese silk. These towels were made in the following way: Two pieces of fine black Japanese silk were sewn together at the edges. Between these two pieces was placed a layer of absorbent cotton about one centimeter thick, and the whole towel was knotted throughout, thus forming a pad. These towels were sterilized in the autoclave. Both kinds of towel above described were used for walling off the operating field. When the incision of the superficial part of the thoracic wall was completed and the hæmostasis secured, the pleural cavity was opened by means of a small incision made in the middle of an intercostal space. A dry white Japanese silk towel was introduced into one end of the incision, while a second one was introduced at the other end. These towels afterwards served as a protection to the anterior and posterior parts of the pleural cavity. Next, the incision of the thoracic wall was completed and the thoracic cavity was opened wide, the lungs being meanwhile completely protected by the towels already introduced. Immediately after this the black silk and cotton padded towels were laid on the upper and lower edges of the wound and introduced into the cavity in such a manner that they respectively protected the upper and lower parts of the pleura. Next, a Gosset retractor was applied and the edges of the wound were retracted as much as was necessary for the purpose of the operation. The edges of the padded towels were arranged in such a way as to circumscribe the operating field and to leave this alone exposed to the air and to the sight of the operator. Additional padded towels could be used afterwards, if necessary, in order to secure a more complete walling off of the operating field. By means of this procedure the pleural cavity appeared to be almost completely protected against the infection produced by the atmospheric germs, as well as against all possible infection or irritation caused by the handling of the serous membrane by the hands of the operators, by the rough sponging with gauze, and by other operative traumatisms. Moreover, when hæmorrhage occurred the blood was prevented from flowing into other parts of the thoracic cavity.

The technique described above was recently used in eight operations of the patching of the pulmonary artery and the incision of the pulmonary orifices, in six operations of cauterization or incision and the suturing of the sigmoid valves and pulmonary orifice, and in one operation of the cauterization of the sigmoid valve of the aorta. In two cases the animal died on the operating table, and in one case in which rubber gloves were not used for the handling of the heart and pericardium the animal died a few days later of pericarditis. The twelve other animals remained in good health. These results thus demonstrate that in extensive operations on the thoracic cavity, which are often accompanied by hæmorrhage from the heart, the pleura can be efficiently protected, and intrathoracic operations may consequently become as safe as operations on the abdominal cavity.

The general principles used in blood-vessel surgery are sufficient for most operations on the heart, and complications such as thrombosis or hæmorrhage can be completely prevented by employing a technique more or less similar to that used for the suturing of large blood-vessels. Nevertheless, there is one complication which often causes death in intracardiac operations and this is the occurrence of air emboli. When the heart is opened wide and closed again by suture it remains filled with air, and when the circulation is reëstablished the blood carries with it a number of air emboli. In operations performed on the right heart or on the pulmonary artery these air emboli did not appear to have any injurious effects; but after the left cavities of the heart or the aorta had been opened and the wall again

closed by suture the reëstablishment of the circulation was always accompanied by the entrance of air emboli which were usually most dangerous. A more or less large quantity of air, according to the nature of the operation, entered the mouth of the coronary arteries and produced small air emboli in the terminal branches. They could easily be seen in the lumen of the vessels and appeared in the form of small air bubbles which filled the ramifications of the arteries. The circulation of the territory invaded by these air emboli was not reëstablished; the muscle remained bluish in color and the heart was unable to recover its normal pulsations. Usually fibrillary contractions occurred a short time after the reëstablishment of the circulation, and this was followed by the death of the animal. The above complications occurred every time the left ventricle or aorta was widely opened and the air was allowed to penetrate the cavities of the heart. It was evident that some procedure serving to prevent the occurrence of air emboli had to be developed before it would be possible to perform intracardiac operations on the left cavities of the heart. The method selected consisted in aspirating the air contained in the heart after the suture of the wall had been completed and before the forceps used to clamp the pedicle of the heart was removed. The aspiration was effected in two different ways. According to the first procedure a needle was introduced into the left ventricle from where the aspiration was effected. In the second instance a curved glass cannula was introduced through the line of suture of the aorta as far as the aortic orifice, and the air was aspirated. By using both these methods the heart could be emptied of air, and the production of air emboli after the reëstablishment of the circulation was prevented. As, however, this method of eliminating the air by means of aspiration was often imperfect, a further method had to be discovered whereby the occurrence of air emboli might not only be prevented but also remedied.

In cases where a great deal of air has entered the coronary arteries no treatment at all would be of any use. If most of the branches of the arteries are filled with air bubbles the fibrillary contractions appear almost immediately after the reëstablishment of the circulation, in which case it is probably too late to apply an efficient method of treatment. Nevertheless, it is not impossible that even in these cases the recovery of the heart can be effected if the air emboli can be removed. The technique to be described was only used in cases in which small amounts of air had been injected into the coronary branches. It is well known that the puncture of an arterial wall with a needle No. 16 is followed by hæmorrhage, but that this hæmorrhage always stops spontaneously after a short time. By introducing a needle No. 16 obliquely under the visceral pericardium and by perforating the wall of the coronary artery hæmorrhage was produced and the air was eliminated at the same time as the blood. This is but a slight sub-pericardial hæmorrhage, which is without danger and is easily arrested. But as soon as the air had been aspirated from the lumen of the artery a normal circulation through the coronary system was reëstablished and the heart immediately resumed its normal pulsations. The prevention of the occurrence of air emboli and their treatment adds greatly to the safety of the operations performed on the cavities of the heart. It eliminates one of the chief causes of fibrillary contraction and subsequent death following upon intracardiac operations.

It is certain that these new methods of procedure do not suffice to eliminate all danger from intrathoracic operations; but at all events they add some important factors of safety to the technique of the operations of the heart and lungs.

AVULSION OF THE SCALP [1]

By ARTHUR AYER LAW, M. D., F. A. C. S., Minneapolis
Associate Professor of Surgery, University of Minnesota

THE blood-spattered pages of American history, up to the time the frontier disappeared, show that surgeons were not unfamiliar with scalping accidents. The American Indian, unlike the head-hunting savages of Borneo and the Philippines, took along the scalp of his victims as one of the trophies of his success in warfare.

Since the first recorded case by Downs, in 1838, surgeons have learned to think of scalping as those cases which were the result of accidental injury — the cases of "industrial scalping" so-called.

Usually the patients are young women working in factories whose hair becomes entangled in a revolving shaft which violently jerks the scalp from the head.

These cases are not extremely rare: Davis in an exhaustive study of the literature collected 92 instances of complete avulsion of the scalp, 81 of which were caused by machinery, 7 by Indians and 4 by other forces. Of the 81 industrial scalpings, 80 were women and the other a Chinaman with a queue.

The student of this condition is impressed with the great length of time these dreadful wounds take to heal even though they are given the benefit of modern treatment. In the earlier records, cases are reported which took from two to four years to cicatrize, and one instance is cited by Syme which was still unhealed after eight years. An analysis of twenty-five reported cases, treated since the technique of skin-grafting became perfected, still shows that an average of ten months' treatment was necessary to cover the denuded heads.

The anatomical structure of the cranium and its coverings explain in large measure this protracted healing period. The scalp is usually torn away through the subaponeurotic layer leaving the pericranium bare, or part of this latter membrane may itself be taken. The outer layer of the skull, unlike most other bones, is nourished largely by the blood-vessels of the diploë; the pericranium plays but a minor rôle in its nutrition, being very thin and but slightly vascular, therefore granulations are a long time in forming on it.

When the skull is laid bare there is frequently necrosis and exfoliation of the outer table, granulations form in the vascular diploë and lift up the thin layer of bone above, which can readily be scaled off.

When granulations do form on the denuded bones they begin at the suture lines where the pericranium as the intersutural membrane dips between the bones to join the dura. These granulations then very slowly spread over the bony tables to finally coalesce and form a new scalp of granulation tissue. Epitheliation must perforce, begin at the skin edges and spread from them over the entire dome of the head.

Is it any wonder, then, that prior to the age of antisepsis, asepsis, and skin grafting many of these patients died of sepsis, meningitis, or erysipelas? When we study the blood supply of the scalp, and the emissary veins and the intercommunication of its arteries and veins with those of the diploë, dura, and dural sinuses, the marvel is that all of these cases do not die of meningitis or cerebral abscesses, for they are all primarily septic.

In most of the reported cases of complete avulsion the integument was torn where it was thinnest, at the level of the brows, or even from the eyelids themselves, the direction of force being exerted from before backwards and the superciliary ridges acting as the wedges which caused the cleavage. Fourchard has demonstrated this in experimental avulsions upon the cadaver. Generally the entire scalp to the level of the ears is torn away — occasionally one or both ears as well are lost; the defect usually ceases at the hair line on the neck. Cushing observes that it is liable to run down on to the center of the neck in a V.

The scalp usually separates from the temporal muscles, leaving them intact; the bellies of the occipitofrontalis, however, are generally taken with it. Hæmorrhage is frequently free and occasionally has required ligation of the blood-vessels; shock is sometimes profound, but if death occurs primarily it is due to hæmorrhage or to other injuries.

Primary pain is rarely severe, but several hours later may be excruciating. After granulations are well established there is little or none. These patients frequently suffer from the prolonged suppuration, nephritis may result, and they are wasted and anæmic.

Elaborate reports detail the efforts of many

[1]Accepted for publication, January 21, 1914.

Photograph taken March 30, 1913. Posterior view showing the "V" at the nape of the neck. Part of old scalp still remaining.

men to cover the large defect present. Keene states that success has attended skin grafting upon the bare bones of the skull; this seems incredible when we consider the necessity of an adequate blood supply to keep the grafts viable.

Repeated efforts have been made to graft alien, or "zoödermic" grafts upon the granulating areas, with 100 per cent of failure, for while a few observers report that lamb's skin apparently "took" it invariably "sloughed inside of two weeks."

Thirteen surgeons have stitched the avulsed scalp back over the defect and with but one exception (and that is doubtful) reported complete sloughing of the scalp.

Others report cutting the shaved scalp into strips and grafting it as such, with general failure.

Hundreds, even thousands, of Reverdin grafts have been used on the same individual with ultimate healing after a long period of time. Plastic sliding operations are reported where a flap from the neck or side of the face, with pedicle attached, has been used to cover the brow or part of the cranium.

Where avulsion was not complete and but the vertex was denuded, after the method of Volkman, four concentric flaps from the edges of the scalp were cut, slid across the wound and united, making a cross of scalp, the defects between the arms of which were grafted in other ways. Whole thickness grafts after the method of Wolfe-Krause were used by Davis with complete success.

It is by Thiersch's method, however, that the greater number of wounds have been healed, and autogenous grafts have given the best results, the "iso" grafts doing well for a time, but ultimately are liable to break down in ulcerations, probably the new blood supply over the skull being less perfect than in other parts of the body where approximately 50 per cent of these grafts take.

In the case the writer reports, in conjunction with Thiersch grafts, amniotic membrane both from the sac and the cord near the fœtus (after the method advised by Stern), was used in three different instances to cover small granulating areas. Two of them definitely took, the third sloughed. Carrel's success with the transplantation of refrigerated tissues which have been kept in paraffin for several days or longer would suggest that this method be tried with whole pieces of scalp or skin.

While a large number of surgeons exhausted their ingenuity in the treatment of this condition, it seems to have escaped their notice that a frontier army surgeon as early as 1769 advocated a procedure which greatly simplified and shortened the time of treatment. James Robertson (as quoted by Felix Robertson in 1806 in the Philadelphia Medical and Physical Journal) advised boring the outer tables of the skull with a shoemaker's awl to let the granulations through from the vascular diploë; this procedure was suggested to him by an unknown French surgeon and was a frequent practice when Indian warfare made the injury common, but has been lost sight of as a surgical procedure since, as the writer finds no record of its use, until Sneve in 1889 reports using this operation to cover a small defect due to a burn over the left parietal bone.

When the writer's case presented itself, the reported histories of long delayed granulations, exfoliation of the outer tables, suppuration and its attendant complications suggested that this method be tried.

His case in detail is as follows:

H. H., female, single, age 19, admitted to my service at the University Hospital, from Osakis, Minnesota, March 28, 1913. She gives the following history: On March 19th, a belt running a cream separator kept slipping from the drum of a line shaft, she got up near the shaft to put the belt on again, her hair caught in the whirling shaft and her scalp was jerked off her head, letting her fall to the floor. She did not faint but bled profusely. Her father was

Photograph taken May 20, 1913, other side of head, 26 days after drill holes were made through the outer table of the skull, showing granulations cropping through and different stages of development, showing thin veil over the granulations on the occiput, due to grafted amniotic membrane.

Photograph taken August 15, 1913. Showing patient with entire scalp of transplanted skin.

present and under telephonic instructions from the doctor put the scalp back on her head and applied hot clothes to it. The doctor arrived an hour and a half later and stitched the scalp in place.

When admitted to the hospital, nine days later, the scalp was still on her head; over the bare bones of the vertex it was dried like rawhide, and was necrotic around the edges; it had shrunk to one-half its original size. The wound commenced in front above the left eyebrow, angling across the forehead, dropping down on to the right eyelid; on the right temple it dipped to the level of the zygoma, skirted the ear, hugged the hair line around the back of the head, ran an inch above the left ear and at the outer edge of the left orbit met another linear wound which ran down on to her cheek and below the lobe of the ear — this wound made a detached triangular flap of scalp, ear, and integument which had been stripped up and was attached only by its base; the whole head area was bathed in pus.

She was septic and with a hæmoglobin of 66 per cent. Her head was dressed with wet gauze wrung out of iodine solution. On the sixth day, after the dried scalp was softened, it was removed, revealing the temporal muscles already granulating, but the entire vertex, frontal and occipital regions bare of pericranium, muscle or granulation tissue save for small isolated islands of granulations along the lamboid suture and on the forehead.

This great wound was daily dressed with the wet iodine gauze and rapidly became reasonably clean. On April 12th, twenty-four days after her injury, there were healthy granulations on the forehead and over the temporal muscles. Under ether anæsthetic these areas were completely covered with Thiersch grafts taken from her thighs. The bare tables of the skull after painting with tincture of iodine, were drilled through to the diploë with a $\frac{1}{8}$-inch drill, the drill holes being $\frac{1}{2}$ inch apart and 57 in number. The grafts and drill holes were covered with strips of gutta percha tissue which in turn was covered with a voluminous gauze dressing saturated with normal salt solution.

Drill holes invading the vascular area of the diploë are an added menace at first, for they are then absorptive; later when the granulations form, they are excretive. This was illustrated by the girl's rapid rise of temperature, from normal on the day of operation, to 104.6° the second and third days thereafter. Her eyes, nose, and cheeks became œdematous and dusky and she was isolated under suspicion of erysipelas.

She ran a temperature for ten days when it again dropped to normal. All the grafts took, but it was not until the twentieth day that granulations appeared in the drill holes; after that they grew rapidly, mushroomed out of the holes and over the bony tables to finally coalesce and cover in the entire denuded area six weeks after the operation. In the meantime the girl developed a mild case of diphtheria and was isolated until June 3d, when the remaining area of the head was covered by Thiersch grafts from her thighs and legs. These as well took save a small area

below the occiput which was rubbed off in her sleep; this was again grafted June 21st, and at the same time a Wolfe-Krause hair-bearing graft was taken from her mons venerus and set into a wound created in the new skin over her right eyebrow, and stitched there by horsehair sutures. This graft lived as did the hair, but about two-thirds of the latter dropped out a month later, probably due to lack of adequate circulation for the hair bulbs — this experience is in keeping with that reported by Enz and Lotheissen. July 12th a small area one by two inches over the vertex had broken down and was grafted with amniotic membrane, with success. July 20th a small area back of the right ear had broken down; this as well was grafted with amniotic membrane, but did not take and finally healed under scarlet red.

July 29th two small areas which had broken down were again grafted with amniotic membrane and healed. August 25th she was entirely healed and left the hospital August 29th, or four and one-half months after the primary operation. At the present writing, except for a small area on the vertex, the new skin is movable, perspires, and is sensitive.

Appreciating that the average time of treatment for these cases is ten months, this simple operation suggested by the unknown traveling French surgeon during the troubled days of the Indian wars, should take its place as an accepted surgical procedure which is both time and life saving.

REFERENCES

ARCHIBALD. Amer. Practice, Surg., v, 1908, 7.
BIVINGS. Phila. M. J., 1902, June 7, 1020.
CUSHING. Keen's Surgery, iii, 1908, 21.
CRILE. Keen's Surgery, i, 892.
CARRELL. J. Am. M. Ass., lix, 523.
DOWNS. Lond. M. Gaz., xxiii, June 23, 1838, 907.
DAVIS. Johns Hopkins Hosp. Reports, xvi, 257.
ENZ. Correspondenzblatt f. Schweizer Ärzte, 1905, xxxv, 701.
FREEMAN. Skin Grafting, 97.
GEROK. Bruns Beitrage, 1892, lx, 329.
HANBOLD. J. Am. M. Ass., xlviii, 1429.
MELLISH. Ann. Surg., Phila., 1904, xl, 644.
NORTHROP. The Hahnemannian Monthly, xlvii, 666.
PHILPOT. Brit. M. J., 1871, Feb. 18, 162.
PETREN. Beitr. z. Klin. Chir., Dec., lx, No. 1, 1–299.
ROBERTSON. Phila. M. & Phys. J., 1806, 27–30.
ROBERTSON. Nashville J. M. & S., 1855.
ROBINSON. Surg., Gynec. & Obst., vii, 663.
SCHAEFER. J. Am. M. Ass., 1893, xx, 149.
SNEVE. Med. News, Phila., 1893, lxii, March 4.
SYNDE. Observations in Clinical Surg., Edinburgh, 1861 173.
STERN. J. Am. M. Ass., lx, 973.

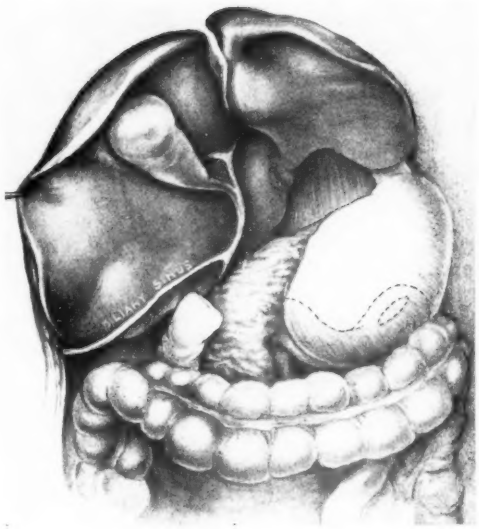
ANTERIOR CHOLEDOJEJUNOSTOMY

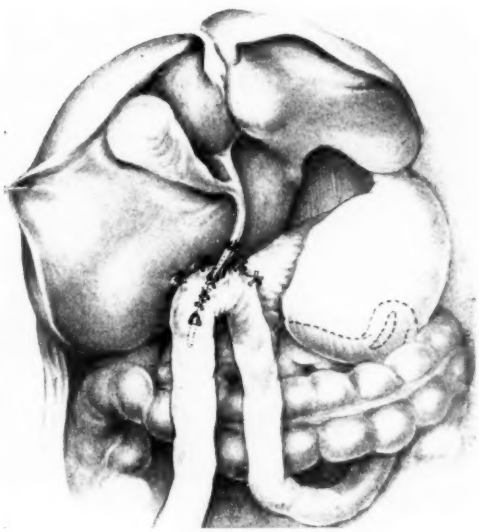
WITH REPORT OF CASE

BY REGINALD H. JACKSON, M. D., MADISON, WISCONSIN

RECONSTRUCTION of the common bile-duct, as practiced in the experimental surgical laboratories on dogs, is often successful. Theoretically, it should be equally feasible in man and doubtless would be practically so if the same conditions could obtain; namely, young, vigorous animals with normal anatomical conditions of organs and tissues. Unfortunately, the obverse conditions usually obtain when the surgeon is forced to contemplate this procedure. Loss of continuity of the duct due to resection for malignant neoplasm, destruction from gangrenous inflammation following impaction of calculi, obliteration from cicatricial contractions, etc., all entail such marked alteration in adjacent structures as to jeopardize, or at least make problematical, the functional activity of an artificially constructed duct. Moreover, the debilitated condition in which these cases usually present themselves compels a minimum of operative trauma. Admittedly, the interests of the patient are best conserved by the surgeon executing the necessary maneuvers with the least expenditure of time and tissue-handling commensurate with the proper accomplishment of the object of the operative procedure.

Reëstablishment of a physiologically active bile-duct in man has not been placed in the category of well-tried surgical procedures with definite indications and technique. To many who essay it for the first time there comes an undue amount of anxiety and hesitancy in performance, together with a deal of doubt as to efficiency when completed. These considerations, engendered by the difficulties encountered in a case of resection of the common-duct for carcinoma, followed by reconstruction of the duct (after the method of Sullivan) with a lethal termination, prompted me to approach my next case with considerable foreboding. The fact that a considerable portion of the duodenum had been removed at a previous operation, thus materially increasing the distance to be spanned by the reconstructed duct, led me in this case to adopt the simple





maneuver of utilizing a more mobile portion of the intestinal canal than the duodenum in its shortened and somewhat atrophied condition offered. A loop of jejunum (that portion embracing its first eighteen inches) was brought up in front of the transverse colon, a procedure which has no doubt been used by others.

Mr. G.—., age 30, laborer. Referred by Dr. A. G. Rowly, Middleton, Wisconsin. Admitted to Madison General Hospital, Jan. 4, 1913, service of Dr. Jackson.

Admitting diagnosis, pyloric obstruction. First operation Jan. 6, 1913. Pylorectomy for malignant growth size of a small lemon situated at pyloric outlet and involving the first part of the duodenum. Removal necessitated slicing off the anterior surface of the pancreas. The bleeding surface of the pancreas was whipped over with chromic catgut. Being fearful that the terminal part of the common-duct might be occluded by cicatrization in the pancreas, choledochotomy was performed and a small rubber drainage tube fastened in place. Posterior gastro-enterostomy.

Subsequent history. Patient made a good recovery and gained rapidly in weight; the entire biliary output, however, came at first through the rubber drainage tube, and, when this was removed at the end of the second week, from the biliary fistula which became persistent. After several months, the condition becoming unbearable to the patient, he requested that an effort be made to relieve him of his fistula.

Second operation. Aug. 5, 1913, seven months after first operation. Abdomen opened through scar of first operation, which was modified into a Bevan's incision. The sinus followed to its origin which now seemed to be almost directly out of the pancreatic substance at the upper border of the head of the gland. All efforts to force a probe through the terminal part of the duct were unavailing, and it was deemed best to attempt to reconstruct the necessary part of a common-duct after the method of Sullivan. The common-duct was cut squarely across where it impinged on the fistulous opening. With its division there was an almost visible retraction of the proximal portion of the duct. It was found that at least two and a half to three inches of artificial duct would have to be constructed. It seemed more feasible and practical to bring up the jejunum in front of the transverse colon and attach the stump of the common-duct to it. This was done by fastening a small caliber soft rubber tube into the duct by a linen stitch, inserting the distal end of tube through a small opening in the wall of the jejunum and infolding the tube and as much of the duct as possible without tension (about one-half inch). The lateral surfaces of jejunum were then abraded and tacked to the adjacent surfaces of liver and pancreas by supporting stitches.

Subsequent history. Uneventful convalescence; discharged from hospital in third week. Remained perfectly well until some time in January, 1914, six months after the last operation, when, without any preliminary symptoms, he had a sudden very profuse hæmatemesis. His home physician reports that for two to three weeks following this he was somewhat jaundiced. This rapidly cleared up, and he is in excellent health at the present time (March, 1914).

Although requested to search his stools for the rubber tube, he has not been faithful in this regard, and it is a question whether it is still *in situ*. It is probable that the hæmatemesis was of purely gastric origin and not due to trauma from dislodgment of tube, as there was no marked evidence of tarry stools.

A NEW METHOD OF CIRCUMCISION

By W. LAWSON THORNTON, M. D., Birmingham, Alabama

THE prepuce is slit dorsally between two artery clamps. By passing a fine needle, threaded with silk, through the skin and around the superficial vessels they may be lightly ligated near the line of incision (Fig. 1).

The ventral margin of prepuce is grasped by a clamp. At intervals of about three-sixteenths of an inch, number nine milliners' needles threaded with fine black silk are placed through mucosa and skin in a line around the penis about one-fourth inch from the corona of glans penis (Fig. 2).

The redundant prepuce is removed by cutting with scissors around the line marked by the needles (Fig. 3).

Each suture is then drawn through and tied. Since all incised tissues are included in the sutures, hæmorrhage should be controlled when sutures are tied. However, if there should be a bleeding point, an additional suture is placed.

This method of circumcision has the following advantages:

The line of incision in skin and mucosa is accurately marked off and held in place by the needles, preventing unevenness and loss of bearings.

Fig. 1.

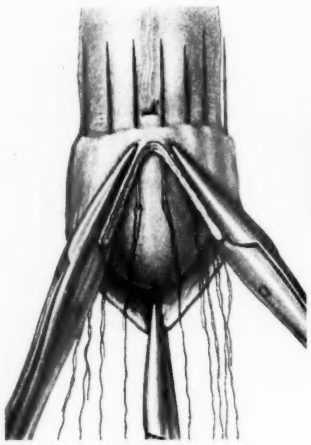


Fig. 2.

Fig. 3.

Complete hæmostasis.

Prevention of retraction of subcutaneous tissues.

Prevention of dead space and subsequent hæmatoma.

Prevention of exposure of subcutaneous tissue to infection.

Less traumatism.

Less pain and priapism following operation.

THE FURTHER DEVELOPMENT OF AN APPARATUS FOR THE TRANSFUSION OF BLOOD

By HENRY S. SATTERLEE, M. D., and RANSOM S. HOOKER, M. D., New York City
From the Laboratory of Clinical Pathology, Department of Medicine, College of Physicians and Surgeons, Columbia University

ABOUT one year ago the authors of the present communication began experiments to develop a method of transfusion which should be sufficiently simple and reliable to commend itself to the general practitioner, thereby enlarging the field of usefulness of this operation.

Since our earlier work on this subject [1] was submitted for publication we have been able to eliminate some disadvantages of the method at that time evolved; and the present development of our method and apparatus is, we believe, sufficiently improved from the practical standpoint to warrant the publication of a detailed account of the procedure with a description of the apparatus.

In order that the reader, who is not familiar with the report of our experimental work, may at once understand the influences which have determined the development of this method of transfusion, it will be pertinent here to summarize briefly the more important factors which have led to our adoption of the present method and apparatus.

It is apparent to any one who has given it consideration that a large field of usefulness would be open to the operation of blood transfusion if it could be performed safely, quickly, and surely by any one possessing ordinary surgical skill and, if possible, without expert assistance. The one serious obstacle in arriving at a simple method of transfusing blood is the element of coagulation. If this obstacle can be fairly met and overcome, all difficulties are solved.

The theoretic factors which have appeared to us most adequately to explain the production of coagulative tendencies in blood transfused through the agency of an intermediate receptacle, are:

1. The admixture of thromboplastin derived from wounded tissue, and more particularly from wounding of the donor's blood-vessel.

2. The liberation of thromboplastin from the formed elements of the blood itself, caused by friction or abrasion of these elements while in process of transfer.

We have sought to guard against the first of these contingencies by penetrating the donor's vein with a cannula, which by a jet of salt solution, is immediately washed clear of any contaminating tissue juices which may be carried into it by the act of removing the obturator. This cannula serves as a protective sheath through which to introduce a pipette directly into the blood-stream of the donor without contact with the wounded wall of the blood-vessel. To avoid abrasion of the intima of the donor's vein by the tip of the pipette while drawing the blood, we have made this tip short and blunt and with its opening in the direction of the blood-current.

We have met the second contingency by having the tip of the pipette of as large caliber and as short a length as practicable and by expanding its channel as rapidly and as evenly as possible; also by having an intact paraffin lining throughout the instrument. This provides a non-moistenable wall which reduces surface friction in the carrying vessel to a minimum. We have also limited the speed and the force with which the blood can be drawn into and expelled from the pipette by employing a method of mouth aspiration by the operator. It is important to state in this connection that we have tried various mechanical means of withdrawing and injecting the blood, such as Politzer bags, piston plunger syringes, etc., and that mouth aspiration is to be preferred to any of these methods. By means of a good metal plunger syringe of 20 ccm. capacity it is easy to effect a pressure or suction of 300 to 400 mm. Hg.; and with such a forcible action it is difficult to judge the degree of effort which is necessary to keep the pressure within what we believe to be the limit of safety. The use of a vacuum and pressure gauge would, of course, obviate this difficulty, but it would also unnecessarily complicate the apparatus.

The accidental factors which we formerly found liable to lead to hindrance in effecting a prompt transfer of blood have been due to difficulty and delay in obtaining an adequate opening into the recipient's vein for the satisfactory discharge of the blood from the pipette. There is often no prominent or large-sized vein which is readily available for use in the recipient, and this leads to a delay in effecting a satisfactory entrance of the cannula. It is, therefore, most desirable that such difficulties should be met and

[1] Satterlee and Hooker: Arch. Internal Med., 1914, xiii, 51.

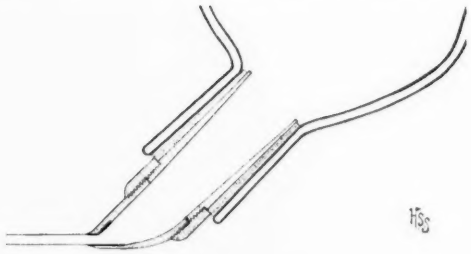


Fig. 1. Sectional view of lower part of pipette. *Specification: Tip* (cylindrical portion) of 14 K. gold seamless drawn tubing 17.0 mm. (0.67 in.) long, ext. diam. 2.32 mm. (0.091 in.), int. diam. 2.03 mm. (0.080 in.); soldered into the funnel portion of the tip at an angle of 45°. Tip (funnel portion) of coin silver interior tapered from 2.03 mm. (0.080 in.) to 10.20 mm. (0.402 in.) flanged externally at larger extremity to fit coupling. *Coupling* of brass, nickel-plated, made from a section of 15.875 (0.625 in.) hexagon rod, drilled and threaded to fit bushing and flanged to form swivel union with tip.[1] *Bushing* of same material as coupling, tapered internally from 10.20 mm. (0.402 in.) to 12.75 mm. (0.502 in.); ext. diam. 13.71 mm. (0.540 in.), threaded at lower extremity to fit coupling. *Cylinder* blown from Jena glass tubing 54.0 mm. (2.126 in.) ext. diam. Neck of cylinder 25.4 mm. (1.0 in.) long with internal diameter tapered from 18.26 mm. (0.7187 in.) to 16.67 mm. (.656 in.). Angle of neck with long axis of cylinder is 30°. *Asbestos packing* made by wrapping around the metal bushing a piece of asbestos tape 25 mm. (1.0 in.) wide and about 0.4 mm. ($\frac{1}{64}$ in.) thick.

[1] The flanged union permits rotary adjustment of direction of the tip, and is a recent improvement not shown in the drawing.

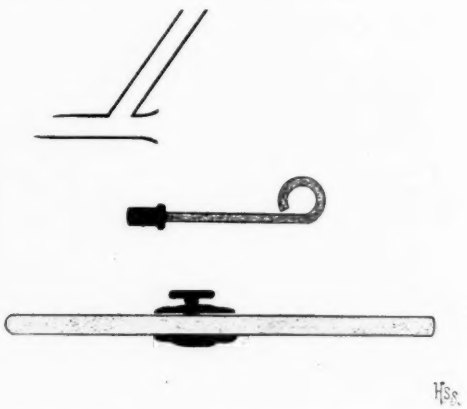


Fig. 2. *Donor's cannula* of 14 K. gold seamless tubing, 2.80 mm. (0.110 in.) ext. diameter and 2.34 mm. (0.092 in.) int. diameter. Cannula is 15 mm. (0.59 in.) long, beveled at distal end and flared at proximal end. Lateral arm 20 mm. (0.79 in.) long, joining cannula at angle of 30°, at 5 mm. (0.197 in.) from proximal end. *Plug* of 10 K. gold, diameter to fit proximal end of cannula snugly; wire handle. *Obturator* of glass rod, 2.25 to 2.30 mm. (0.089 to 0.091 in.) in diameter.

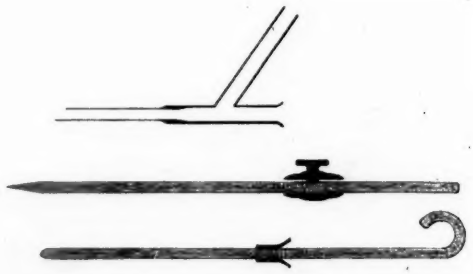


Fig. 3. *Recipient's cannula:* Proximal part is of 14 K. or 10 K. gold seamless tubing, same diameters as donor's cannula and of similar construction. Into the distal end of this is soldered a platinum-iridium cannula of smaller caliber which may vary in size and length according to requirements. The size found most useful is 15 mm. (0.59 in.) long, 2.05 mm. (0.080 in.) ext. diameter and 1.78 mm. (0.070 in.) int. diameter. Cannulas of smaller diameter may be used for smaller veins and for penetrating the skin. The obturators are made of 10 K. drawn gold wire of a diameter to fit the platinum cannulas and of a convenient length for handling. The stop on the obturator is made to fit into the flared end of the cannula. Trocars are made the same as obturators but with trocar points.

Fig. 4. Pipette with air-filter containing sterile cotton and aspirating tube.

overcome before the actual transfer of blood is begun. The method which we have developed provides such a preparation by the means to be described, and we have found that this preparation obviates all the accidental difficulties which we had formerly encountered.

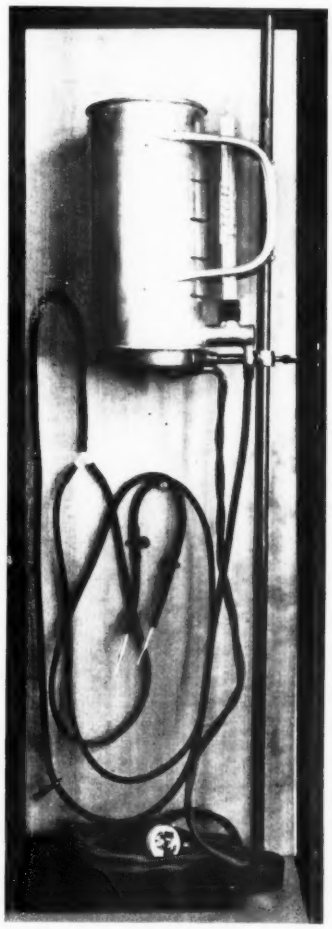


Fig. 5. *Irrigating apparatus*, comprising copper vessel, heavily tinned inside and outside, of three liters capacity, with outlet made from block tin. Outlet has a larger tubulation above for insertion of glass gauge-tube and thermometer, and smaller tubulation below for attachment of rubber tubing. An electric heating plate serves as a support, and is attached by an arm and set-screw to an iron rod, which latter is fastened into a cast iron foot-piece. A sliding sleeve of celluloid can be moved to any position on the glass gauge and is graduated in ccm. to measure the discharge of fluid from the vessel.

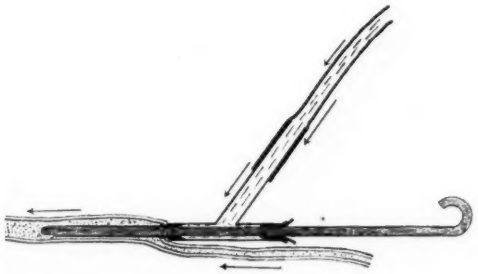


Fig. 6. Recipient's cannula with obturator in vein.

The changes which we have made since our earlier report are as follows:

1. A means of penetrating the donor's blood-vessel so that the paraffin-lined tip of the pipette may be introduced beyond the point of puncture without contact with the wounded wall of the vessel.

2. The employment of cannulas with openings in the direction of the long axis of the blood-vessels. This allows a more effectual withdrawal and delivery of blood, and also minimizes the tendency of the vessel-wall to collapse against the opening of the cannula while aspirating the blood from the donor's vessel.

3. The use of cannulas for the recipient of smaller caliber and of various sizes, so that smaller veins may be utilized in the recipient than was formerly possible.

4. A method of inserting the cannulas so that both donor's and recipient's vessels are tapped

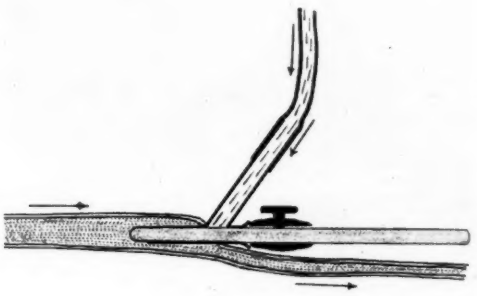


Fig. 7. Donor's cannula with obturator in vein.

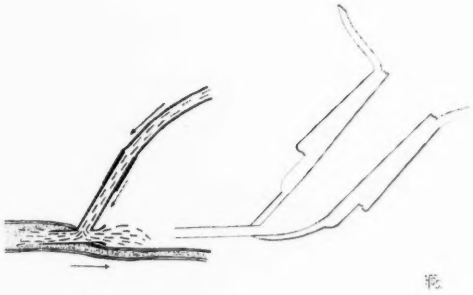


Fig. 8. Obturator removed from donor's cannula and pipette about to be introduced into donor's vein.

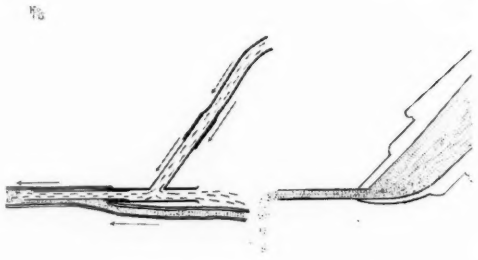


Fig. 10. Obturator removed from recipient's cannula and pipette full of blood at the moment of introduction.

and in readiness before the transfusion is started. This not only assures a successful transfer of blood, through the certainty of effecting a prompt entrance into both vessels, but also allows more time for the actual withdrawal and delivery of the blood and makes haste unnecessary.

5. The employment of a system of tubing for supplying hot normal salt solution to the canals of the donor's and recipient's cannulas by means of a lateral inlet provided in the cannulas for this purpose. By this arrangement the cannulas are instantly and automatically filled with salt solution during the brief interval required for the exchange of trocars, obturators, or the tip of the pipette. This contrivance furthermore provides a convenient means of giving the donor a saline infusion at the conclusion of the operation without additional preparation.

6. A modification of the pipette cannulas so that the tips only are made of gold and silver, and these are made to join by threaded couplings to the metal bushings. The bushings are of nickel, and are wrapped with asbestos tape and seated in the necks of the cylinders. Any number of cylinders may thus be prepared and kept ready, coated with paraffin. When required for use the cannula tips are screwed on, and a second paraffin coating is applied to the lower portion of the pipette. The details of this construction are shown in Fig. 1.

7. A method of coating the cylinders which is easier, quicker, and more certain to produce a satisfactory coating of paraffin than the method formerly described.

The changes above noted have come as the result of further clinical trial and of a later series of experiments on animals which there is not space here to detail. The aim of this paper is simply to describe the method so that others may test its usefulness.

METHOD OF OPERATION

Instruments. Knife, scissors, serrated forceps, mouse-tooth forceps, several mosquito clamps; donor's cannula with obturator, and plug (Fig. 2); recipient's cannula of appropriate size (or two sizes may be prepared in readiness) with

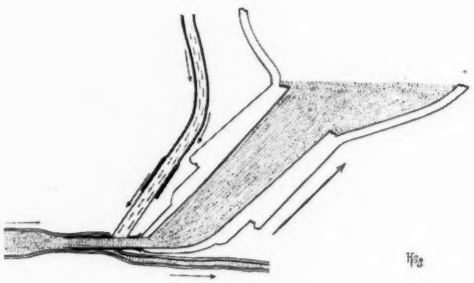


Fig. 9. Aspiration of blood from donor's vein.

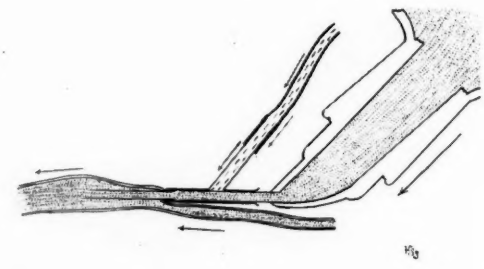


Fig. 11. Blood being delivered through recipient's cannula.

trocars and obturators (Fig. 3); needles and silk for suturing skin; hypodermic syringe and needles for local anæsthesia.

Apparatus. One or more pipettes coated with paraffin under sterile precautions and provided with cotton air-filters and aspirating tubes, as shown in Fig. 4. An irrigating apparatus for two liters of salt solution with a system of rubber tubing having a double distribution by means of a Y connection and separate stop-cocks for donor's and recipient's cannulas, as shown in Fig. 5;[1] or a separate supply of salt solution may be used for donor and for recipient if in separate rooms. An ordinary two-quart rubber douche-bag may be sterilized and used for this purpose. The salt solution should be prepared as for any intravenous saline infusion and the source of supply should be at a height of about four feet from the outlet. A pneumatic cuff, similar to that of a blood-pressure apparatus but about half as wide, with an inflating pump, is useful for constricting the donor's arm; or a piece of heavy rubber tubing with a large clamp may be used for this purpose.

Operation. The donor's and recipient's vessels are selected for their size and prominence avoiding the close proximity of a valve, and the field of operation is painted with tincture of iodine and then washed off with alcohol. The veins at the bend of the elbow are usually the most serviceable. If the recipient is a young child, the external jugular vein is usually the most satisfactory vessel to select, and this may be entered by the smallest size cannula and trocar without skin incision, as described by Wollstein and Morgan.[2]

Local anæsthesia for the exposure of the veins in recipient and donor is produced in the usual way with a two per cent novocaine solution and about two to three cm. of the vein is exposed to view. The vessels should be denuded of their fascial sheath to facilitate penetration.

The recipient's and donor's cannulas are now connected to their respective ends of the irrigation apparatus by fine rubber connecting tubes and salt solution is allowed to flow through the cannulas to expel all air. The recipient's trocar and the donor's obturator are then inserted in their respective cannulas, the recipient's obturator is placed in readiness for use, and all stop-cocks are opened. The recipient's vein is first entered with the recipient's trocar and cannula in the direction of the current and the trocar withdrawn; the obturator is then inserted (Fig. 6) and a pad of moist gauze placed over the field of operation. It is important to enter the vein at a point well away from the center of its exposed portion, so that the position and direction of the cannula when inside the vein may be seen and controlled.

The donor's arm is then constricted and the operator enters the donor's vein through a small incision, with the donor's obturator and cannula against the direction of the blood-current (Fig. 7). The mouthpiece of the aspirating tube is next grasped in the teeth of the operator and the pipette is allowed to hang thus for a moment while the donor's obturator is withdrawn, using both hands for this purpose. With the left hand still steadying the cannula in the vein, the right hand grasps the pipette and introduces its tip (Fig. 8) against the outpouring stream of salt solution, through the donor's cannula, into the blood-stream of the donor. The aspiration of blood (Fig. 9) is begun immediately, and suction should be strong enough to get about the maximum flow without undue collapse of the vein-wall against the cannula. A speed of withdrawal greater than 100 ccm. per minute should not be attempted. It is well here to mention that it is a wise precaution to treat the donor's vein gently in all manipulations and when making the incision to avoid wounding its opposite wall. A bystander may take the time from the beginning of the blood-flow so that there may be some guide to the speed of withdrawal and delivery.

Two hundred ccm. of blood can be obtained from a good donor in one and one-half to four minutes, and this amount may be delivered through the large and medium sized cannulas in from two to four minutes, making a total of four to eight minutes. We have considered twelve to fifteen minutes the limit of safety, and even with ten minutes as a limit there is an ample margin of time, so that there is no need for haste.

When the amount required is obtained (200 ccm. or less) the pipette is withdrawn from the donor's cannula and the obturator inserted, the tip of the pipette being stoppered as soon as withdrawn by a gloved finger of the operator.

The insertion of the donor's obturator is most conveniently done by an assistant, but it may nevertheless be done by the left hand of the operator. It is important to stop suction *before* with-

[1] Any irrigation apparatus which works by hydrostatic pressure and which can be sterilized will answer the purpose of the contrivance shown in the illustration. The authors have, however, devised the apparatus here shown to meet their especial requirements, and it will be found useful for any purpose where infusions or hot irrigations are desired. The distinctive features are the heating plate and water gauge, which latter also permits the insertion of a thermometer for taking temperature readings at the point of outflow. A sliding indicator on the gauge is graduated in cubic centimeters and serves to measure the volume of discharge at any level of the fluid.

[2] Wollstein and Morgan: Am. J. Dis. Child., 1912, iv, 198.

drawal of the pipette so that no air-bubbles may be drawn through the blood at the moment of removal from the vein.

The pipette containing the blood is now carried to the recipient, the obturator of the recipient's cannula is withdrawn, and the tip of the pipette is inserted against the outflowing stream of salt solution into the recipient's cannula. Fig. 10 shows the outflowing stream of blood, released by the removal of the operator's finger from the tip of the pipette just at the moment of introduction into the recipient's cannula. Fig. 11 shows the tip of the pipette within the recipient's cannula while the blood is being delivered. The last 10 or 15 ccm. of blood are not discharged from the pipette in order to avoid risk of injecting air. When this point is reached, the pipette is withdrawn from the recipient's cannula and the obturator is replaced.

If more blood is needed, another transfusion may be done in precisely the same way, using another pipette; or an assistant may collect a second pipetteful of blood from the donor immediately following the withdrawal of the first pipette. This rapid sequence of withdrawing blood from the donor is, of course, more expeditious, and is advisable if more than 400 ccm. (two pipettefuls) of blood are required. Where the interrupted method is followed, care should be taken to remove all constriction and to allow a free circulation of blood through the donor's vein during the intervals when the blood is not being withdrawn.

Although the trocar method of entering the recipient's vein has been described and is the one illustrated, it is equally satisfactory to incise the vein with a small knife or scissors as in the case of the donor, and to introduce the cannula with tapered obturator through such an incision. As a matter of experience this method has been found advisable where the veins are small or the situation cramped, because either of these contingencies make it difficult to enter the lumen of the vessel by the direct introduction of a sharp trocar.

When the transfer of blood is completed, the recipient's cannula is removed and pressure applied with a compress for a few minutes. Pressure and suturing of the skin will usually suffice to stop oozing from the vein. If desirable, the donor may now be given a saline infusion to replace his lost blood, simply by substituting a short plug in the donor's cannula for the obturator. This stops the outlet of the cannula but does not shut off the passage of the salt solution through its lateral arm into the vein. Hæmorrhage from the donor's vein after the cannula is withdrawn can sometimes be stopped by pressure; but usually the puncture should be tied off laterally with fine catgut or sutured. During the course of the operation neither the donor nor the recipient receives more than an inconsiderable amount of salt solution, unless more is desired. It may easily be seen, however, that with this arrangement any amount of salt solution can be immediately directed into the circulation of donor or recipient as required.

Preparation of the pipettes. The preparation of the pipettes and the method of lining them with paraffin remains to be described. The threaded bushings of the cylinders are first wrapped with thin asbestos tape and securely seated in the cylinders. The air-filter tubes and the cylinders are then sterilized by dry heat in an autoclave or ordinary oven, and the rubber aspirating tubes with mouthpieces and perforated rubber stoppers are sterilized by boiling. When sterilized, each cylinder is connected with an air-filter by means of a perforated rubber stopper, and an aspirating tube with mouthpiece is attached. The cylinders are then ready for coating. The rubber stoppers and aspirating tubes should be thoroughly dry before being connected with the cylinders.

The process of coating the pipettes must be conducted with aseptic precautions. The coating is best done from a cylindrical vessel, about three and one half inches in diameter and seven or eight inches high, filled to within an inch of the top with the sterile paraffin mixture. The mixture which we have used is:

Grübler's filtered paraffin, m.p. 60°–62° C., 56 parts by weight.

Pure white petrolatum, 44 parts by weight.

This mixture can be sterilized by heating to 120° C. for an hour. We have found that a convenient vessel for melting and holding the paraffin is an electric warmer for a ten-ounce nursing-bottle, with heating-coil immersed directly in the paraffin.

For the first coating the paraffin is heated to from 77 to 80° C.;[1] the mouth of the cylinder is then immersed beneath the surface and the paraffin sucked up into the cylinder to within about 1 cm. of the rubber stopper. The paraffin is maintained at this level until its heat has spread to the cylinder, which is shown by the

[1] The temperature here recommended, 77° to 80° C., corresponds to our earlier observation of the optimum temperature for the first coating. By the former method the cylinders were coated by immersion in a large bath of the paraffin mixture, and the temperature then recommended was 68° to 71° C. By the present method the temperature of the bath must be raised about 9° C. higher, to allow for the chilling which takes place when the paraffin rises in the cylinder.

film over the glass becoming transparent. As soon as this occurs the paraffin is allowed to flow out and the cylinder is placed aside to cool.

The pipette tips and couplings may be sterilized by boiling or by dry heat. If boiled a short time before coating, they should be freed from moisture before being attached to the cylinders. This can easily be done by drying over an alcohol flame. The coated cylinders may be wrapped in sterile towels and kept in this way until needed; or the pipette tips may be attached and a second paraffin coating applied at once, the completely coated pipettes being then wrapped in sterile coverings ready for immediate use.

The second coating, with the tip attached to the cylinder, is done at 60°–61° C. by dipping the tip of the pipette beneath the surface of the melted paraffin and aspirating enough paraffin to reach about two cm. above the neck of the cylinder and immediately expelling it again. When all the excess of paraffin which has been taken into the pipette is blown out in this manner, bubbles of air will be seen to escape from the submerged tip of the pipette. The pipette is then raised out of the paraffin and its tip is tilted upward while air is still being blown through it. This latter precaution is to prevent a narrowing of the lumen of the tip by delayed congealing of the last few drops of excess paraffin. The lumen of the tip can easily be inspected by transmitted light; if it has not a good clear opening, it should again be immersed in the paraffin and the operation repeated until satisfactory.

A detailed specification of the construction of our pipette and cannulas is given under Figs. 1, 2, and 3; and all of these instruments can be made from the drawings by competent workmen. The gold and silver pipette tips and the gold and platinum cannulas we have had made from seamless drawn tubing by a manufacturing jeweler. The bushings and couplings have been turned out on a lathe by a machinist, and the cylinders have been blown and graduated by a glass-blower. Although we have not at present arranged for the manufacture and distribution of these instruments, we expect to do so if the demand should warrant it.

In considering the means of overcoming the factors which promote the coagulation of blood transfused through an intermediate receptacle, we have in this paper purposely confined our discussion to the use of paraffin, and have avoided refer ence to the use of hirudin. For some time past we have been conducting experiments with hirudin which are now giving considerable promise of practical application; that is to say, we have in animals with repeated success transfused blood, by a preliminary wetting of the interior of the apparatus here described with a very small quantity of hirudin dissolved in salt solution, dispensing altogether with the paraffin lining of the pipette; but we are not yet prepared to report on this subject.

We wish to make grateful acknowledgment to Professor K. M. Vogel for the courtesies extended to us in his laboratory.

THE USE OF PITUITARY EXTRACT IN LABOR

By D. G. MADILL, M. B., and R. M. ALLAN, M. B., Dublin, Ireland
Assistants to the Master at the Rotunda Hospital, Dublin

DURING recent years the ductless glands of the human body have been receiving a good deal of attention in the laboratory of the physiologist, whose experiments have resulted in very important discoveries; and in no case have the results been more remarkable than in that of the pituitary gland. Since the year 1895 such eminent physiologists as Oliver (1), Schafer (1), and Howell (2) have been investigating the functions of this gland, arriving at definite conclusions regarding its effect on blood-pressure, kidney secretion, etc.; but it was not until the publication of a well-known paper by W. Blair Bell (3) of Liverpool in the year 1909 that its great use in obstetrics became recognized. Since then, a considerable amount of literature, mainly German, has been published, relative to its efficiency or otherwise in maternity cases; and this paper is intended to add another to the surprisingly few contributions in English on the subject.

By way of introduction to our paper, we think it well to refer very briefly to the anatomy and physiology of the gland. The pituitary gland lies at the base of the brain in a depression of the sphenoid bone known as the sella turcica. It consists of two lobes, an anterior derived from an upgrowth of the buccal cavity, and a posterior de-

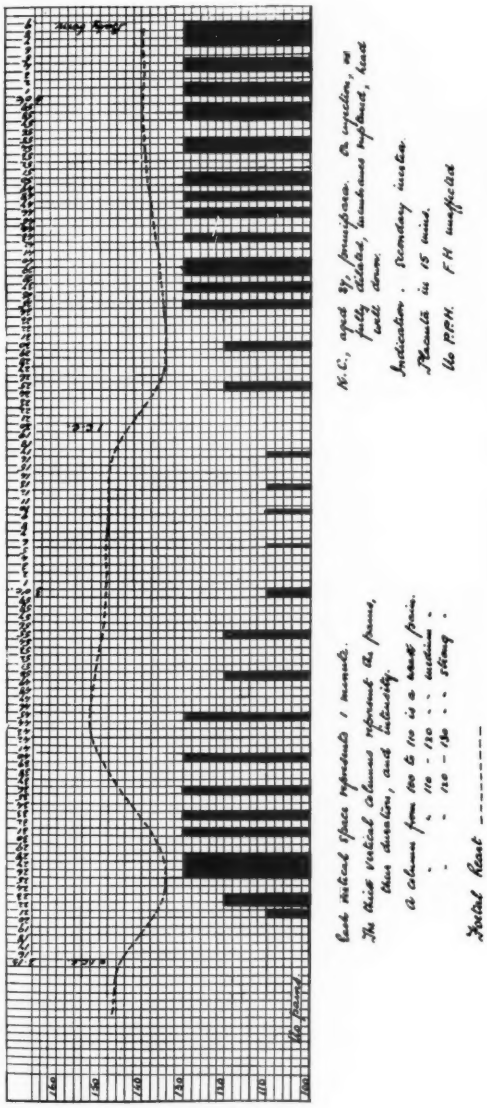
rived from a downgrowth of the third ventricle; these lobes are connected by an intermediate part which has the same origin as the anterior lobe. Experimental research has shown that it is the intermediate part and the posterior lobe alone which have any physiological effect on unstriated muscle and blood-pressure, and it is from these portions of the gland that the extract is made.

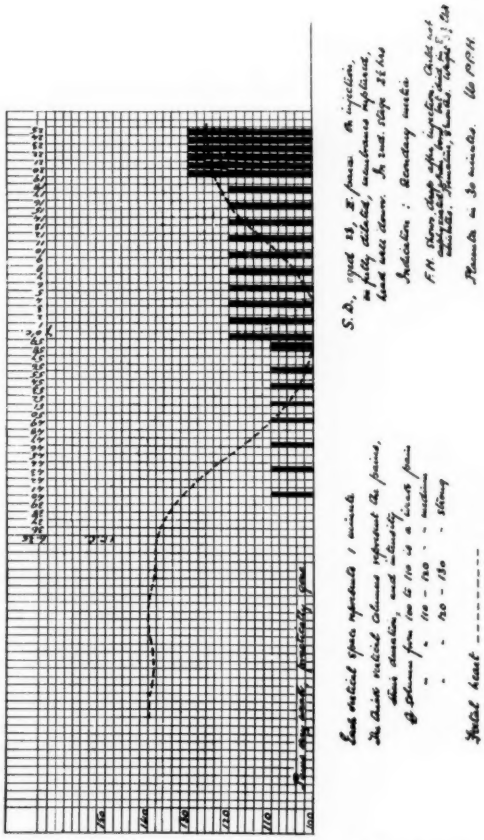
There are at least three preparations on the market at the present time known under different names: vaporole infundin, pituglandol, and pituitrin. Of these we have only had experience with the first named, but we understand that there is no difference in effect whichever preparation is used. In each case 1 ccm. = .2 gm. of the extract was the strength used in all our cases. We never gave a smaller dose, being of the opinion that 1 ccm. produced better results than two ½ ccms. with an interval between. The drug may be injected intravenously, intramuscularly, and subcutaneously, the effect being somewhat different in each case. In reference to this we quote an extract from a paper published by Heaney (4) of Chicago in the year 1913. In it he says: "Because of the possibility of an undiagnosed condition contra-indicating an upright increase in blood-pressure and arteriole contraction, the intravenous administration is unsuited to routine use, and should be reserved for emergency cases where immediate action is highly desirable, such as severe post-partum hæmorrhage. Where a fairly rapid result is wanted, intramuscular administration is much safer. For general use, a subcutaneous injection should be employed, since it is without the possibilities of harmful blood-pressure effects, and is as safe so far as the skin is concerned as is ordinary hypodermic medication." Since the publication of this paper, we substituted subcutaneous injections for intramuscular, with, we think, better results. The injections are usually given in the arm, but it does not matter in what part of the body they are given. An important point which might be mentioned here is that the drug is not poisonous to the mother even in large doses, and is not cumulative in its effect if repeated doses are given.

In this paper we report the results of 147 cases, and for the sake of clearness we divide it into the following headings:

1. The effect on the uterus.
2. The effect on the fœtus.
3. The indications and contra-indications.
4. Its use in placenta prævia.
5. The after-results.

1. *The effect on the uterus.* In the words of W. Blair Bell, "pituitary extract causes powerful contractions of the pregnant, puerperal, and menstruating uterus." He also states that its effect is equally apparent on the atonic and the contracting uterus. Our own observations agree with those of most others that the contractions resulting from the drug still retain their physiological character; that is to say, with very few exceptions, they are rhythmical and intermittent, but not tonic. This fact cannot be too strongly emphasized, as it is the fundamental principle governing the use of pituitary extract in labor cases. The exceptions referred to are a few cases in which the final pain seemed to extend over an interval of several minutes, but even in these the contractions were not what might be properly termed tonic, as regular slight relaxations of the uterus were always observed during the pains. These pseudotonic contractions (if we might call them so) invariably took place when the head was about to be delivered, so that one would be justified in regarding them as a simple exaggeration of the normal character of the pains at that time, when they are practically continuous. We also observed that the interval between the pains was diminished. In our series of cases where the extract was administered during the second stage, pains followed one another with an average interval of one minute and a half, where we would normally expect an interval of two to four minutes. We found that the interval elapsing from the time of injection till the onset of the first labor pain varied from two to six minutes, with an average of three and a half minutes. Taking primiparæ and multiparæ together, if the baby was not born as a result of the injection, we found that the effect of the drug lasted fifty minutes; and if birth resulted, an interval of seventeen minutes elapsed. The placenta was always expelled spontaneously, except in four cases where it was adherent and required manual removal, and in no case was there any incarceration. Strassmann (5) noted in his cases an earlier detachment and expulsion of the placenta, an observation made independently by ourselves, for we found the placenta ready for expression in eighteen minutes in primiparæ, and in eleven minutes in multiparæ; in six instances — one being a primipara — it was expelled statim, without any ill effect. Although as Fischer (6) states, the effect of the injection is better the further advanced in labor the patient is at the time, this does not prevent its use during the first stage. In our series, four primiparæ and nine multiparæ got injections during the





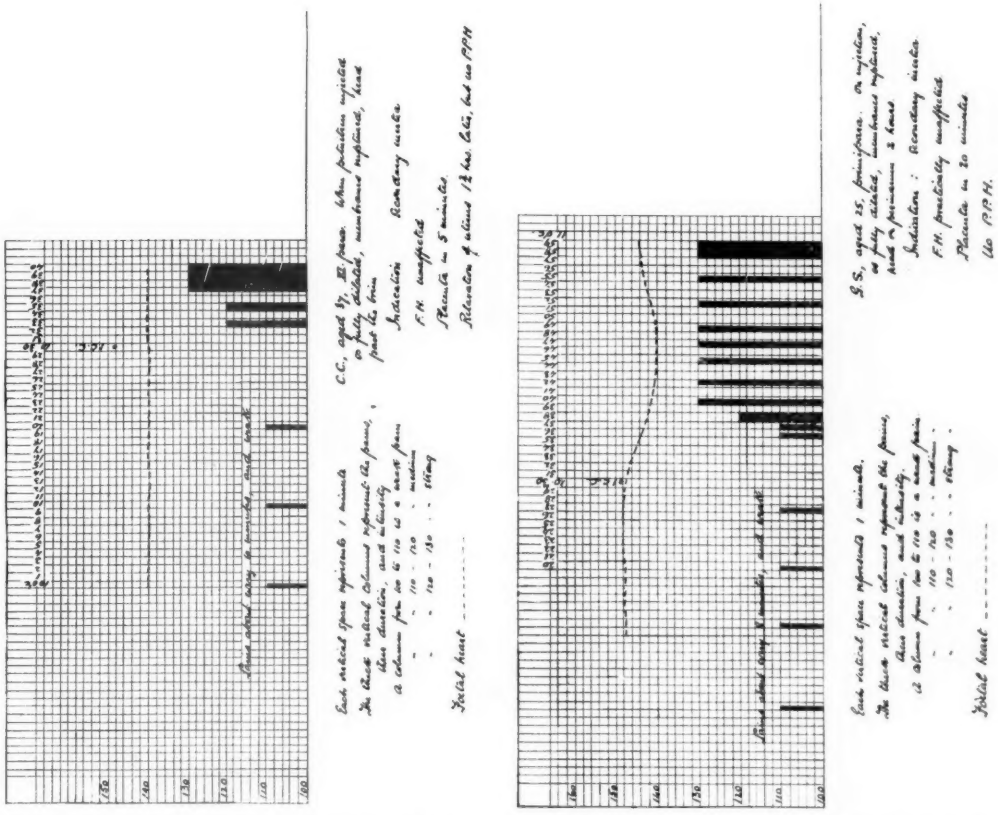
first stage for primary inertia; the injection was given when the cervix was from one-half to three-quarters dilated in the primiparæ, and was followed by the birth of the child in two hours; in the multiparæ the cervix was about one-quarter dilated, and was followed by birth in an average of forty minutes. It should be stated that in none of these cases was there a suspicion of any obstruction whatever to the birth of the child, as we consider its administration unjustifiable if such evidence is present.

An anæsthetic does not interfere with the action of the drug; and even if it fails to expel the fœtus spontaneously, its effect in dilating the cervix is so marked that it renders the application of the forceps in many cases easy.

2. *The effect on the fœtus.* Hoffbauer (7) and Fischer (6) noted a slowing of the fœtal heart after the injection, but both are emphatic that there is no permanent ill effect on the child. We found it not unusual for the fœtal heart to drop to 120, and occasionally to 100, but except in a few cases the child was born in good condition. These exceptional cases numbered ten. One occurred in a multipara, the child being born in white asphyxia, and did not recover, but it should be stated that this child was a premature twin at thirty-five weeks. The other nine occurred in

primiparæ; of these, five were born dead, and four were born in asphyxia, two recovering. This still leaves a fœtal mortality of seven. Two of these seven had the cord tight around the neck, and one was a difficult breech delivery in a case of contracted pelvis with a conjugate of 9 cms. It is hardly fair to attribute the loss of these children to the use of pituitary extract; therefore, if they are excluded, there still remain four fœtal deaths unaccounted for except as a possible result of the injection. We consider this effect on the fœtus to be of the very first importance, and we state these four cases in some detail. In one, the fœtal heart was heard at a certain time 140 and strong; eight minutes later on listening again it had dropped to 100; forceps were applied at once, but the child was delivered dead. The patient was a primipara, and the head was unfixed for some time after she came into labor, so it is highly probable there was a minor degree of pelvic contraction. A sudden drop similar to this was observed in the second of these cases, where the fœtal heart was counted 128 five minutes before delivery, and the child was born spontaneously, but dead. The third case was one of contracted pelvis with a conjugate of 9¼ cms.; the pains had become weak, the cervix was fully dilated, and the head was through the brim, when 1 ccm. was given. Contractions came on strong at intervals of three minutes for half an hour, when they again become feeble. Another injection was given, and pains occurred at intervals of two minutes till the baby was born in thirty minutes. During this time there was no sign of fœtal distress, and nothing unusual was noted about the fœtal heart. The fourth case was one in which more gradual slowing was observed; forceps were applied as soon as possible, but too late to save the child. We consider it very controversial whether the sudden drop in the fœtal heart rate in these cases was the direct result of the administration of the drug, or whether other causes were operating to bring it about. Apart altogether from this, a comparison of the fœtal mortality between cases treated by pituitary extract and those treated by forceps without the extract is interesting. From June 1, 1912, till February 28th of this year, 147 cases were treated in the Rotunda Hospital by pituitary extract, in the vast majority of which forceps would undoubtedly have been applied, and only four fœtal deaths could not reasonably be accounted for; during the same period 106 cases were treated by forceps, with a fœtal mortality of fifteen. These figures would, we think, help to prove that there is at least no additional risk to the fœtus attending the use of the drug, and taking into account the absence of intra-uterine manipulation and consequent decrease in th maternal morbidity, we would advocate it administration in most cases where forceps seems the only alternative.

3. *The indications and contra-indications.* (*a*) Before labor. Pituitary extract has been used by some obstetricians as a means of emptying the uterus in cases of abortion. Stern (8) and Fischer (6) report two cases each, all of which were failures. We have not employed it for this object, and so far as we can learn from a careful study of the literature, the drug seems little better than useless so early in pregnancy. It has also been administered for the purpose of inducing premature labor, and in this respect the results are more encouraging. Stern (9) reports three successful cases of induction for laryngeal and pulmonary tuberculosis at the eighth and ninth months, two with pituitary extract alone, and one with the assistance of a Champetier de Ribes' bag. Pouliot (10) reports six cases from Paris, three of which were for minor degrees of contracted pelvis, with two successes; two were for cases of premature rupture of the membranes before the onset of labor, both of which were successful, but in reference to these the writer states that the drug may only have augmented contractions which were bound to come; the remaining case was one of macerated fœtus at six months which failed. Hirsch (11) reports four cases, all of which were successful. Our own experience of inducing labor by pituitary extract alone is confined to one patient suffering from chronic nephritis who was seven months pregnant, and the fœtus was dead. Two ccms. were successful in bringing on pains, and the birth of the fœtus followed in six hours. In spite of these successes, there scarcely seems sufficient evidence to come to any definite conclusion regarding its actual value in inducing labor unaided, as up to the present, more failures have been reported than successes. Benthin (12) of Frankfort, amongst others, emphatically says that pituitary extract has no effect on the uterus when not in labor, since the uterus at this time is refractory and does not respond, whereas it does respond to the smallest dose when in labor. As an adjunct, however, to induction by version or Champetier de Ribes' bag, it is distinctly valuable. We have given it in two such cases, one for dead fœtus after version, where labor pains had come on, but had gone off again in three hours. One ccm. was given, and contractions came on strong, expelling the fœtus in five minutes. The other case,



though not exactly one of induction of labor, illustrates the excellence of the combined treatment. It was one of transverse presentation with the cervix half dilated, the arm prolapsed, and no pains present. The arm was pushed up, internal cephalic version performed, and the head brought over the brim. A tight binder was applied, and two ccms. caused the birth of the baby in forty-five minutes.

(*b*) During labor. This is universally regarded as the best time for its administration, and the strong indication here is secondary uterine inertia, especially when the cervix is fully dilated, and the head well through the brim. In our series, 120 patients in secondary inertia got the drug during the second stage, 87 being primiparæ, and 33 multiparæ. The average duration of labor before injection was nineteen hours in the primiparæ, and seven hours in the multiparæ; and the time elapsing from injection till the birth of the child averaged twenty-two minutes and eleven minutes respectively. Thirteen patients got the drug for primary inertia, four primiparæ and nine multiparæ. The duration of labor before injection was twenty hours in the primiparæ, and thirteen hours in the multiparæ; the interval after injection till the birth of the child was, on an average, two hours and forty minutes respectively. We also employed pituitary extract with excellent results in seven cases of overdistention, i. e., hydramnios and twins, where the uterus had become inert after the rupture of the membranes; but as these were really cases of inertia, they have been included in the above. A brief reference might be made here with advantage regarding its use in minor degrees of pelvic contraction. In spite of the strong support given to this indication by almost all authorities who have used the drug, our experience in this respect has not been fortunate. We gave it in three cases, all of which have been referred to above, with fatal results in all three. In one of

these, the extract might justly be exonerated from all blame, as it was a difficult breech delivery through a pelvis nine centimeters in the true conjugate, but there was no extenuating circumstance in either of the other two. Whether the fœtus had already been sufficiently compressed by the efforts of the uterus to drive the head through the brim, and so was unable to withstand the extra pressure resulting from the injection of the drug, or whether in all such cases the use of forceps alone would be attended with better results, is, we think, still an open question. We note only one remaining indication for its employment during actual labor, and that is that it should be given as a prophylactic to multiparæ with a history of post-partum hæmorrhage or retained placenta in their previous labors. For such patients the correct time for injection is just immediately before the birth of the child. We have only had an opportunity of using it so in two cases, one being successful.

(*c*) After labor. Post-partum hæmorrhage was the great and original reason for its employment in obstetrics. We always gave it with some preparation of ergot, generally ernutin, in serious cases, with undoubted benefit. Though only intermittently contracting the uterus, it raises the blood-pressure and counteracts shock, ernutin doing the major work as far as controlling the hæmorrhage is concerned, by causing tonic contraction. Its value in this respect is a matter of common knowledge, and we consider it unnecessary to refer to it at greater length, except to plead for its routine use in all such severe cases.

Regarding the contra-indications to pituitary extract, patients suffering from chronic renal disease with raised blood-pressure, and chronic cardiac disease, have long been considered as unfavorable for its use, but some doubt has been recently thrown upon this idea. Trapl (13), who reports 177 cases, states that carditis and nephritis are not contra-indications, but advises very cautious employment of the drug. Stern (14) has induced labor with repeated injections in cases of nephritis, without any ill effects. We have successfully induced labor in one case of severe chronic nephritis, without the slightest injury to the patient, and have also used it in several cases of simple albuminuria, in no case with any bad effect. From our experience of one patient, we do not advise its use in heart disease. She was a multipara admitted in labor with a cervix one-quarter dilated, the membranes ruptured, and the head fixed. Her pains had not been strong, and after admission disappeared altogether. She had a very bad bronchitic cough, and heart trouble was not suspected at the time. One ccm. was given. No pains came on, but twenty minutes later the patient suddenly collapsed, with cyanosis, labored breathing, and uncountable pulse. Forceps were applied immediately and the child delivered. The patient recovered by treatment with stimulants, saline infusions, etc., but the case emphasizes the danger of the drug in heart lesions. It is hardly necessary to state that additional contra-indications to its use would be found in marked slowing of the fœtal heart, threatened rupture of the uterus, and other conditions of a like nature.

4. *Its use in placenta prævia.* Most writers are agreed about its important effect here, and it is found at its best in combination with treatment by version or the bag. Very few cases can be traced where it has been used unaided, but Hoffbauer (15) is a strong advocate of its employment in cases of lateral placenta prævia, the only other treatment being rupture of the membranes. As an adjunct to treatment by version or the bag, its administration is advisable if one expects to save the child, while the advantage to the mother is apparent owing to the rapidity with which birth follows version. Trapl (16) reports sixteen cases, fifteen lateral and one central, with three fœtal deaths. Gall (17) had ten cases, nine central and one lateral. There were three dead children, but in all three no fœtal heart was heard, and pituitary extract was given for maternal reasons. We have employed it in five patients with placenta prævia, four lateral and one marginal; two of the five children were born dead. These cases are not numerous, but taken together we find the fœtal mortality under 20 per cent, a very encouraging result when one considers that at present the mortality stands at something between 40 per cent and 60 per cent. Although the period of labor is much shortened, no instance of laceration of the cervix has yet been recorded so far as we know, nor was there any laceration or post-partum hæmorrhage in our cases.

5. *Its after-results.* Such unfavorable consequences as vomiting, tinnitus, spasm of the cervix (18), and tetanus uteri have been reported, though we have not met with any of these complications. Post-partum atony of the uterus with slight hæmorrhage has been observed by many. This is said to be most liable to occur when more than one hour elapses between injection and birth on account of the relaxation of the uterus which might be expected when the action of the drug has worn off. In six of our cases relaxation and slight post-partum hæmorrhage were observed,

TABLE I.

Indications.	Number of cases	Para		Delivery		Result to child	
		Primiparæ	Multiparæ	Spontaneous	Forceps	Alive	Dead
Primary inertia	13	4	9	9	4	10	3
Secondary inertia	120	87	33	103	17	115	5
Placenta prævia	5	1	4	5		3	2
Prophylactic incasure with history of previous post-partum hæmorrhage	2		2				
Induction of premature labor.							
Alone	1		1	1			1 (macerated)
Combined with other treatment	2		2	1		1	1 (dead befor injection)

There were four total failures.

TABLE II.

Indications	Number of injections			Average duration of labor before injection		Average interval from injection till birth of child		Average length of third stage	
	One	Two	Three	Primiparæ	Multiparæ	Primiparæ	Multiparæ	Primiparæ	Multiparæ
Primary inertia	9	3	1	20 hours	13 hours	2 hours	40 minutes	20 minutes	18 minutes
Secondary inertia	107	11	2	19 hours	7 hours	22 minutes	11 minutes	18 minutes	11 minutes

though in only one of these was there an interval of more than one hour between injection and birth. This was a case of a multipara whose baby was born an hour and a half after the dose was given, and she had a history of post-partum hæmorrhage in former labors. In each instance the uterus hardened by treatment with ergot alone, so that we do not regard them as real cases of post-partum hæmorrhage.

Schmidt (19) observed after-pains in 50 per cent of cases. No other authority seems to have reported such an occurrence, and certainly we have not noticed it, the uterus being invariably well involuted.

There were five morbid cases, four of which were associated with forceps, which really reduces the morbidity to one, out of all the patients treated by pituitary extract alone. Considering that the morbidity in forceps operations is about 20 per cent and that the vast majority of these would otherwise have been delivered by forceps, the result so far as maternal morbidity is concerned is satisfactory.

A good deal has been written about the galactogogue action of this drug. Though only two babies required artificial feeding, we could not satisfy ourselves that it had any specific effect in promoting the supply of milk. Indeed Heaney (20) has almost conclusively proved that its action in this particular is on the smooth muscle fiber of the breast, and not on the milk-glands.

Speaking generally, pituitary extract is as suitable for the private as for the hospital patient, though we are far from advising the careless or incautious use of the drug. Even in the most suitable cases, its administration involves a little anxiety, because the fœtal heart rate must be carefully and repeatedly noted after the injection. From our own experience we have arrived at the following conclusions regarding it:

1. Pituitary extract undoubtedly increases the strength of the uterine contractions.
2. These strengthened contractions maintain their physiological character.
3. The best results are obtained when given during the second stage.
4. Its use reduces the number of forceps operations, with consequent lessening of morbidity in these cases.
5. It is safe for the mother, and at least as safe as forceps for the child.
6. It gives improved results for both mother and fœtus in cases of placenta prævia, if used in combination with version.
7. The puerperium is normal.

We append the following tables summarizing our results, also a number of diagrams illustrating the effect of pituitary extract on the uterus in labor:

We should like to acknowledge our indebtedness to the master for giving us every facility to experiment with this drug, and for many valuable suggestions, also for permission to report the results of our work.

BIBLIOGRAPHY

1. Oliver and Schafer. J. Physiol., xvi, xvii, xviii.
2. Howell. J. Exper. Med., 1898, iii.
3. W. Blair Bell. Brit. Med. J., 1909, Dec.
4. Heaney. Surg., Gynec., & Obst., 1913, xvii, 103.
5. Strassmann. Zentralbl. f. Gynäk., 23, 1912.
6. Fischer. Zentralbl. f. Gynäk., 1, 1912.
7. Hoffbauer. Zentralbl. f. Gynäk., 46, 1911.
8. Stern. Zentralbl. Gynäk., 31, 1911.
9. Stern. Berl. klin. Wchnschr., 32, 1911.
10. Pouliot. Bull. de la Soc. d' obst. et d. gynéc., Par., 1912, 6.
11. Hirsch. München. med. Wchnschr., 1912, 18.
12. Benthin. J. Obst. & Gynec., 1912, April.
13. Trapl. Zentralbl. f. Gynäk., 1913, i.
14. Stern. Zentralbl. f. Gynäk., 1911, 31.
15. Hoffbauer. München. med. Wchnschr., 1912, lix 22.
16. Trapl. Monatschr. f. Geburtsh. u. Gynäk., iv, No. 36.
17. Gall. Zentralbl. f. Gynäk., 1913, 10.
18. Ham. München. med. Wchnschr., 1912, 2, Rieck, ibid.
19. Schmidt. Gynäk. Rundschau, 1911.
20. Heaney. Surg., Gynec., & Obst., 1913, 103, xvii.

THE AXILLARY SUP

By GEORGE S. FOSTER, M. D., Manchester, New Hampshire
Surgeon and Pathologist to the Hospital Notre Dame de Lourdes

WHILE studying with Sir William Arbuthnot Lane at Guy's Hospital, I noted that in all of his intestinal short-circuit work he instituted a very novel method of giving free fluid to the support of the circulatory system. As a result these cases came from the table in many instances in better clinical condition than when they were taken to the operating room.

It is with no idea of originality that I bring this matter forward in this country, yet I have applied a name to the method which has heretofore been without a name. Upon returning to my own field of labor I resolved to try out this Lane procedure under the name of "axillary sup," and here is the report of my observations upon fifty cases of general surgery:

The fluid used is normal saline solution which is placed in a reservoir to which is connected a "Y" rubber tube with glass connections. The single tube of this "Y" is sufficiently long to permit it to be coiled within a porcelain enamel basin filled with hot water kept at 110 degrees. The saline solution is also poured into the reservoir at this same temperature. Such an arrangement allows of a drop of from five degrees to ten degrees before reaching the hypodermoclysis needles.

The reservoir is placed at a proper elevation so that sufficient column pressure is exerted to easily force the saline into the subcutaneous tissues. The hypodermoclysis needles are always kept very sharp that they may pierce the skin with ease. They are three inches long, with the lumen large enough to permit a free stream of the fluid. Before introducing the needle the operator should be sure that no air remains in the tubes and that the saline running from the needles is of the proper temperature. This is a very important part of the technique as there is no reason for procedure if the fluid is cool. We do not desire to take any heat from the body, but rather to add to the local temperature if it is necessary.

Preparation of the field for introduction of the needle. After the patient is fully under the anæsthetic the chest is laid bare. The arms are secured at the sides by a retentive strap attached to the wrists and running beneath the buttocks or small of the back as the case may be. Any danger of extreme pressure upon the arms and forearms upon the table edge is avoided by padding with towels. This is an important thing to look out for.

A section of the skin area just inside of the external border of the pectoralis major muscle over its most prominent part and above the mammary gland is cleansed with antiseptic soap. The suds is then wiped away and the skin perfectly dried with sterile gauze. This skin area is then painted with full-strength tincture of iodine. After this technique has been carried out in the strictest surgically clean sense, we have two circular skin areas, one over each pectoral muscle, about three inches in diameter.

Method of introduction. While the fluid is running the needles are introduced piercing the pectoralis muscle in a direction outward and slightly tilted downward until the needle point is seen to push the loose skin of the axilla before it. The point is then moved about slightly to make sure it is properly situated and free.

A very important point when introducing the needles is to make sure they enter no part of the mammary gland. Should any portion of this

gland intercede, the needle becomes occluded and seepage rendered imperfect, which may discourage the beginner. The technique of introducing the needles is the criterion for successful drinking during the operation.

Trial cases. The writer has used the axillary sup in fifty general surgical cases. These cases have not been selected but were taken in the order of admission. The series included all conditions within the abdomen, some in the chest and other parts of the body.

The amount of fluid supped during any operation depends upon the time consumed in operating. No case has supped less than forty ounces and some cases have taken as high as one hundred and forty ounces during an operation. The average operation upon an average sized individual will require between seventy-five and ninety ounces.

At the completion of the operation the upper anterior and lateral chest wall are well rounded out, resembling the appearance of a well-padded football player, and the axillæ are completely filled and rounded out.

This series of cases included patients of ages varying from twelve years to fifty years, of fat, lean, or medium build.

At the completion of the operation the needles are withdrawn and the skin apertures sealed with collodion and sterile cotton. It is very important that these apertures be sealed very tightly and watched a moment to detect any leakage. The upper anterior chest and axillæ are full and round. In fact, the loose subcutaneous space in the axillæ is taken up and the space itself practically obliterated, and, as before stated, the appearance of the chest is that of a well-padded football player.

Reviewing the fifty general surgical cases in which the axillary sup has been used it was noted that post-etheral nausea and vomiting were entirely absent. Not one of these cases herein tabled had any post-etheral vomiting. During the period that these statistics were collected many general surgical cases were not given the sup as we desired control cases to prove the efficacy of this method eliminating post-etheral vomiting. There was a marked contrast in the two conditions. The ones having the sup were not in the least ether sea-sick. On the other hand, the majority of the control cases were nauseated and vomited. What an ideal way in which to secure a patient from the unpleasantness of ether gastritis and toxæmia! This only goes to prove more forcibly that ether vomiting is a true toxæmia amenable to dilution and elimination.

Next comes the question of post-operative shock. When the sup is used the patient continually drinks saline, not only during the operation, but for several hours afterward. Thus in none of the cases, no matter how lengthy or serious the operative procedure, was post-operative shock met. How simple this summary as a shock, yet how important! Why should we have shock? the blood-vessels are kept well filled and the body soft tissues carefully bathed. That is just what prevents surgical shock. If for no other reason the axillary sup should be a part of supreme technique in all general surgical cases requiring other than a very few moments for operative procedure. This merely backs up Crile's firm theory as to the cause of surgical shock.

Again, in this series of cases no post-operative subcutaneous stimulation was indicated. Strychnine, digitalin, and the like were left on the shelf; the patient knew nothing of the hypodermic needle for stimulating purposes; the cardiac action was regular and normal, and the whip was never used on the tired horse, so to speak.

Freedom from pain following the operation was very noticeable. Whether the sup is an active means to this end the author refrains from stating at the present time. However, pain was conspicuous by its absence, and narcotics were given infrequently. The absence of gas in the intestines was remarked upon by not a few of the subjects.

The period of extreme thirst following the use of any general anæsthetic has been a bugbear to humanity and a torment to the surgeon. In this series of cases there was no complaint of extreme thirst, or in fact, thirst of any marked degree. They drank continuously without being aware of this fact and the parched lips and mouth were not theirs.

Dr. J. B. Murphy of Chicago has also done much by instituting his rectal drop method. This has truly been a great life-saver and a welcome procedure to the shocked and thirsty patient. With all due credit to the drop method, I found that none of these cases required its institution. It would seem that the sup is more congenial to the patient, as it is all accomplished during the etheral slumber, yet serves for hours afterward.

One untoward effect was noted in two of the cases; namely, obstructed respirations. Both of these were young girls, thin in build and anæmic. At no time was it considered a serious obstacle to the use of the axillary sup. Each of these cases took over ninety ounces.

It was noted that slight cyanosis was present and the respirations became somewhat labored and below the normal count. Withdrawal of the needles and retirement is all the needed treatment.

We have learned that careful observation as to the fullness of the axillæ and tabulation of amount being consumed on five minute time will prevent this minor matter.

The pressure of the fluid against the chest wall must never be so great as to cause distress, but there is no danger if we fully understand the principles of the physics. Axillary sup should be a regular entity for all general surgical cases that our patients may be made the more comfortable after the operation.

RECAPITULATION

By the axillary sup:—

1. Post-anæsthetic vomiting is eliminated.
2. Surgical shock is ruled out.
3. Hypodermic or other stimulation is shelved.
4. Freedom from pain and gas is noticeable.
5. The dreaded after-thirst is not there.
6. Regular and full cardiac action is maintained.
7. The Murphy drop is not a necessity, yet should not be forgotten.
8. The patients return from the operating room in better clinical condition than when they entered.
9. A watch should be kept for obstructed respiration; however, it will not occur under the trained eye of familiarity.

CORRESPONDENCE

A WEEK OF POST-GRADUATE SURGICAL WORK IN DÜSSELDORF, GERMANY

Düsseldorf, the city which is known to us because of its remarkable municipal government and for its proximity to the world-renowned Krupp gunworks and other great manufacturing plants, contains a very unique institution known as the "Academy of Practical Medicine." In this institution a special course in "Operative Medicine" is given for practitioners of surgery and gynecology. The course extends over a period of one week each year.

This course is conducted under the direction of the well-known surgeon, Professor Witzel, the director of the wonderful Municipal Hospital, who has recently visited America.

The clinics are given by celebrated clinicians from all parts of Europe as well as by professors of the academy, each individual teacher being a recognized authority on the subject which he will teach.

During the present year the course will be conducted from September 28th to October 3d, inclusive. The course is free; 25 marks (about $6.00) will be paid by each surgeon attending to cover incidental expenses of conducting the course.

The committee in charge of the course consists of the following surgeons, whose names are familiar to every American surgeon: D'Arcy-Power, London; Bastianelli, Rome; Depage, Brussels; Dollinger, Budapest; von Eiselsberg, Vienna; A. Hoffmann, Düsseldorf; Janssen, Düsseldorf; Kirchner, Berlin; Krönig, Freiburg; Lanz, Amsterdam; Pankow, Düsseldorf; de Quervain, Basel; Rovsing, Copenhagen; von Schjerning, Berlin; Walther, Paris; and Witzel, Düsseldorf.

American surgeons will be welcome. A detailed program giving the time of each clinic will be sent upon application to The Secretary, Akademie für praktische Medizin Düsseldorf, Germany.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

EDITORIAL AND BUSINESS OFFICES
30 NORTH MICHIGAN AVE. . CHICAGO, U. S. A.

PUBLISHERS FOR GREAT BRITAIN
BAILLIERE, TINDALL & COX
8 HENRIETTA ST., COVENT GARDEN, LONDON, W. C.
ENGLAND

SUBSCRIPTION, PER ANNUM, IN ADVANCE
United States and Canada $5.00
Foreign Countries . . . $6.00 (25 Shillings)

Managing Editor . FRANKLIN H. MARTIN, M.D.
Associate Editor . . ALLEN B. KANAVEL, M.D.

AUGUST, 1914

OBSTETRICAL SCIENCE IN AMERICA

At the recent meeting of the American Gynecological Society the subject of the address by the president, Dr. J. Whitridge Williams, was a review of the scientific work done in obstetrics by the members of the Society since its foundation. This covers a period of between thirty and forty years, at a time when those men were in active work, who established gynecology as a branch of surgery, and were prominent in obstetrics. The writer of the address had examined all papers written by members of the Society upon obstetrics, and found in them a lamentable absence of material of genuine scientific value. While there were many papers describing groups of cases, there were few making genuine contributions to knowledge, and few which showed a study of the important problems remaining unsolved in this branch of medical science.

It may be of interest to ask what is the situation at the present day, as regards scientific work, by American obstetricians and gynecologists. If the writing of papers quoted by a standard review be taken as a test, the following may be of interest:

The Jahresbericht über die Fortschritte auf dem Gebiete der Geburtshüilfe und Gynäkologie, conducted by Franz in Berlin and Veit in Halle, published yearly, furnishes a complete summary of the contributions to obstetrics and gynecology throughout the world. The volume which reviews the literature of 1912 contains in its index of authors more than two thousand names. If one of the most frequently used letters in the alphabet be selected, and the names of authors beginning with this be classified, it is found that in papers upon obstetrics and gynecology throughout the world, one in twenty was written by an American, and this includes the names of well-known general surgeons, who do many abdominal operations for all indications. Further observation upon the literary output from the standpoint of nations shows the fecundity of German writers, and the interesting development of obstetrical literature in Italy throughout the past ten years. The English and French also contribute largely.

It may be urged against this criticism that the writing of papers is no real index of scientific work. At present the clinical aspect of medicine in America is pushed to the limit. The performance of a large number of operations may give wide personal experience, but unless these cases be studied accurately, reported truthfully, and conclu-

sions drawn from them with good judgment, results, so far as science is concerned, will be disappointing. Unquestionably, we in America have gone further in the clinical side than in the accurate and studious aspect of medical study.

To what can be ascribed the cause of this condition? In large part, to the economic factor which obliges a man holding a Chair as a professor to support himself and his family entirely or partially from private practice. It was once said that American medical literature is written after nine in the evening, when a full day's work has first been done. It is greatly to the credit of American medicine that under these conditions the American profession has made lasting contributions of inestimable value to medical science. But the time has now come when something better may be hoped for and should be attained.

The permanent endowment of medical colleges, whether independent schools of value or departments of universities, and the payment of adequate salaries to men competent to study, to write, and to teach, are imperative if American medical science is to develop and take its merited place in the scientific world. No other solution is possible, for the limits of human endurance are reached and often overstepped in the professional work of American medical men. That the American obstetrician is equal to any is shown by his operative skill, his low percentage of mortality and morbidity, and his prompt acceptance of valuable methods of treatment, from any source. With the exception of his German colleagues, he unquestionably has a wider acquaintance with the obstetrical literature of the world than most others, but his circumstances are such that it has been impossible for him to maintain himself, keep abreast of the evolution of obstetrical surgery, and make original investigations in addition. He must be freed from financial burdens and given adequate support in his scientific career.

EDWARD P. DAVIS.

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

THE 333D REGULAR MONTHLY MEETING WAS HELD MAY 15, 1914, DR. FRANK W. LYNCH, PRESIDENT OF THE SOCIETY, OCCUPYING THE CHAIR

Dr. Rudolph Holmes presented "A Report of Three Cæsarean Sections for Unusual Indications."

DR. RUDOLPH W. HOLMES: Recently, I had three cæsarean sections for rather unusual indications. The first was indicated by myocarditis with excessive loss of compensation.

Mrs. K. 27, III-para. The patient was under my care during the first pregnancy, which was complicated with a cystitis and severe inflammatory rheumatism. Labor was terminated by me in 1909 by a difficult forceps operation. Her convalescence was slow. She secured another attendent for her second confinement, which was spontaneous, but complicated by post-partum hæmorrhage and a protracted puerperal sepsis. In this second pregnancy she had a second attack of her rheumatism.

I saw her when she was between three and four months pregnant in this, her third, gestation. At the time she was very ill with an enormous cardiac dilatation with its resulting loss of compensation. She lay in the hospital for several weeks, with some slight improvement. During her stay in the hospital, in fact until after her delivery, the heart was acting so tumultuously that a definite, positive diagnosis of the actual cause of the cardiac murmur was not made, though the leakage was considered to be due largely to the dilatation: prior to this it was held that she probably had a mitral, or possibly aortic, insufficiency. After delivery her condition improved so rapidly, and really phenomenally, that it was definitely determined that the lesion was mitral. During her stay in the hospital during the mid-period of her pregnancy, and later as the time for delivery was near, she was frequently examined by Drs. Anders Frick and Ethan A. Gray, who supervised the cardiac therapy. In view of her previous difficulties in labor, and directly due to her cardiac infirmity, both Drs. Gray and Frick advised the quickest means of delivery, so an abdominal section was agreed upon, with a sterilizing procedure. The operation was performed March 3, a few days before term. The broad ligaments were enormously congested; the pampiniform plexus commonly shows material dilatation of its vessels, but in her they were quite as large as the thumb. After the section, a double salpingectomy was done, burying the uterine ends. A noteworthy observation was that the moment the uterus was eventrated her breathing became quiet, and on coming out of the anæsthesia her dyspencea had largely disappeared. She and her baby left the hospital at the end of the third week, the baby having been weaned.

The second case was for double congenital dislocation of the hips, with rachitis.

Mrs. R., age 36, was delivered three years before, after twenty-four hours of labor by forceps; a midwife was in attendance, but finally a physician was called. From the husband's remarks one might be led to believe that the delivery was accomplished by an unscientific craniotomy (!) by the use of forceps. As a result of the double dislocation she had a marked tilting of the pelvis: there was a slight lumbodorsal scoliosis, and some lordosis in the same region, the latter largely determined by the posture she had to assume on account of the posterior dislocation of the hips. The vera was 8½ cm., with a marked diminution in the anteroposterior diameter of the whole pelvis. Mother and child returned home in two weeks.

The third case was for osteosarcoma of the right sacral ala.

Mrs. P., age 19. On admission to the hospital, April 20, I found the head in the left inguinal fossa, and, from the excessive torsion of the uterus, the bladder distended and lying in the right iliac fossa. The picture of the abdominal contour was such that I surmised that the right ovary was cystic, prolapsed, and adherent in the cul-de-sac, which would explain the rotation of the uterus, and the dislodged head; on vaginal examination, however, this was found incorrect, for a large, somewhat cystic tumor was found integral to the right wing of the sacrum. This tumor encroached upon the cavity of the pelvis to such a degree that slightly more that a finger's-breadth of space existed between it and the ramus of the pubes. The tumor extended from the fourth to the second sacral vertebræ. The cervix was pulled high up in the left sacro-iliac fossa. The bladder was catheterized, about twelve ounces of urine being withdrawn. She was twelve days from term, and as she had been having contractions for some hours, preparation was made at once for a section. Her appendix was removed after the cæsarean operation was completed.

This woman, as the previous (second) one, had a phenomenal convalescence—hardly any discomfort; in fact, as little disturbances of pulse, temperature, and abdominal discomforts as one sees after a normal confinement.

A month after the cæsarean, Dr. N. M. Percy opened the abdomen, and removed such of the tumor as was possible. It proved to be a small round-cell sarcoma.

Some two years and more ago I did a cæsarean section, and two weeks later it was necessary to reënter the abdomen to remove the appendix. Since then I have been accustomed as a routine to remove the appendix prophylactically. I do not believe this procedure complicates the section

—only taking a few moments' time. I believe the appendectomy should be a routine procedure where the condition of the patient warrants it.

DR. C. S. BACON: What anæsthesia was used?

DR. HOLMES: I use ether, or gas and ether.

DR. C. F. PADDOCK: Mr. President, the doctor is to be congratulated upon the success of his cases, and especially that the after-pains or gas-pains were lacking. Personally, I have not had that experience. I have performed a number of cæsarean sections, and the patients have suffered more or less from pains. I do not know how Dr. Holmes's patients happened to avoid the suffering. Then, again, the doctor says that ether was given in the case in question, and I presume ether was given in the other cases. It would seem to me from the evidence we are getting of local anæsthesia that in the heart-case local anæsthesia would have been the anæsthesia to have used. I am not so sure but that local anæsthesia will be used more and more and eventually become the anæsthesia to be used in cases of cæsarean section. During the past few weeks there have been seven or eight cases operated on in this city under local anæsthesia. I witnessed one of them where the woman conversed during the operation, with absolutely no pain. The operation was conducted in a scientific manner and the recovery was prompt in this case—practically no after-pains, as I remember. She did not have the nausea we generally see, and it seems to me that in that heart-case local anæsthesia would have been the thing to use.

DR. A. BELCHAM KEYES: I would like to say about after-pains that there seems to be no law. I was surprised by the internes at the Cook County Hospital telling me that only in cases where morphine was given did the women have any after-pains. I have performed laparotomy and have been told that there was no after-pain whatever. I believe it is entirely an individual feature, and that there is no blame on the average careful operator at all. I wish to accentuate what Dr. Paddock has said about local anæsthesia. In cardiopathia, with a large amount of albumin, local anæsthetics do remarkably well. The patients pass through the operation practically without any shock. I had heard that Dr. Webster had been having great success with local anæsthesia, so I performed a section upon a heart-case under the same method. At no time did the uterus require any more care than we gave under general anæsthesia. To my surprise the patient seemed to have no discomfort afterwards, and I agree with Dr. Paddock that it will become more and more popular.

DR. HOLMES (in reply): The chance of dying from ether or gas anæsthesia is very remote, and as for myself I would prefer to assume such risk rather than to submit to the distress, mental and nervous, which accompany a local or nerve-blocking anæsthesia. Holding this view for myself, I would be loathe to employ it on a patient of mine. We have gone through all the different methods of spinal anæsthesia, and have seen one after the other fall by the wayside as the risks materialize: just now it is nerve-blocking, but I believe this will go the way of its predecessors. I have yet to be convinced that the mental effect is good for a patient to know and to hear all that necessarily must go on in an operating room. I know one woman who is a mental wreck from having had spinal blocking.

In the third case, on reopening the abdomen we found the uterus, bladder, and bowel adherent to the parietal wall. She had no rise of temperature, or pulse acceleration—was remarkably free from all discomforts following her cæsarean, and yet these extensive adhesions were found. Likewise clean cases (gynecological) will be operated and shortly afterwards, on reopening the abdomen, extensive adhesions will be found; *per contra*, one will find on operation broad, dense adhesions—in pus-tube cases for example; and yet later on reopening the abdomen will be entirely free from adhesions. If the truth were known I believe adhesions would be found a very constant sequence of abdominal work, but, being transitory, quickly are absorbed.

DR. GEORGE DE TARNOWSKY presented a paper entitled "Calcified Uterine Fibroid Compressing the Sigmoid Colon—Inaugural Thesis." (See p. 169.)

DISCUSSION

DR. A. BELCHAM KEYES: I, like Dr. Tarnowsky, lost my calcified fibroid at the Presbyterian Hospital. It was about as hard as anything could possibly be, and struck the specimen pan with a stony sound. It was about the size of a small orange. It was a pedunculated fibroid, easily removed, with a very small pedicle. The specimen I considered of great value because they are spoken of so highly in the books and museums.

The patient was about 58 years old. She was on the table for a fibroid with a large ovarian tumor almost filling the abdomen. On opening the abdomen, what I had considered an enormous cystic ovary was a retroperitoneal tumor. At that time I took eighteen quarts of fluid away, and reduced the size; and examining the organs below I found a small, orange-sized tumor, entirely

calcified—I didn't saw it through because it was stolen before I could do so. The woman had no symptoms whatever. There was no change in the intestines, at which I was surprised, because of its weight. No diagnosis of the calcified fibroid was made, but diagnosis of a small fibroid, which I almost considered negligible. Two weeks afterward I made an incision and shelled it out. It was large enough to fill an enormous basin. I think the woman was so disturbed by the large tumor that she was not aware of the other symptoms. The hardness of it made me think of the possibility of superficial calcification.

I wish to speak of one point regarding the X-ray. Dr. Potter makes the remark that calcification the size of three ordinary grains of wheat should give an X-ray picture, but he had had no actual experience in an actual fibroid case.

DR. BERTHA VAN HOOSEN: I was very much instructed by Dr. Tarnowsky's paper, because I had not realized before that these tumors were so rare. It has happened that I have seen quite a large number of partially calcified tumors—nearly a dozen—and one in particular.

I operated on a patient last fall who had four calcified tumors, each one about the size of a billiard ball. The patient suffered a tremendous vascular disturbance. Dr. Tice had been treating her for two or three months. She had tremendous œdema of the legs and cardiac asthma. After failing to relieve her he asked me if I would attempt to remove it. We operated under local anæsthesia, and found a large fibroid about the size of a cocoanut in the fundus. It was interstitial, and at the base of the uterus. Situated one on either side of the uterine artery were the large calcareous tumors. The one on the right side was making such pressure on the ureter that the latter was distended to nearly half the size of my wrist. The tumors were fairly easily removed. One of the peculiar things about it was that the large interstitial fibroid was necrotic. I had never seen one before. It looked exactly as if made of ivory, and on cutting it open it was found to contain a large quantity of necrotic fluid. Another thing that was peculiar about this case was that in making the incision it had to be carried up above the umbilicus. It was impossible to dissect any farther without cutting out a calcareous plate directly under the umbilicus. The patient had so many points covered by Dr. Tarnowsky that I was especially interested.

DR. DE TARNOWSKY (concluding the discussion): I was very glad to hear Dr. Van Hoosen say she had been fortunate enough to see twelve cases. I am sorry I did not hear of the case she operated on, for I certainly would have mentioned it, as it was very interesting indeed.

DR. THEO. J. DOEDERLEIN read a paper on "Dysmenorrhea Essentialis." (See p. 165.)

DISCUSSION

DR. ALEX. C. WIENER: The reason Dr. Doederlien became interested in the views I represent was that in the treatment of tuberculosis the minimum deviations in the position of the spine have been found to have very great practical importance in the relation to many symptoms in the organism—goiter, interstitial nephritis, chronic catarrh of the colon, and a number of other minor symptoms. Poncy was the first man who applied the tubercular toxæmia to clinical symptoms. Heyer holds that in all primary dysmenorrhœas—dysmenorrhœa which appears with the first menstruation—it is caused by a tubercular toxæmia; and what is meant by a tubercular toxæmia is that in some remote part of the body, a bronchial gland or an omental gland, discharges a tubercular fluid producing partial immunity of the organism. This toxic immunity consists of a chemical substance which has not yet been isolated. This partial immunity goes on until finally the toxins become an irritant, and thus are produced by the toxins proliferations of connective tissue in various parts of the body, and clinical symptoms arise from this very source. One of the clinical symptoms is dysmenorrhœa, chronic endometritis due to excessive connective tissue in the endometrium; just the same as we have, in goiters, proliferation of the connective tissue, with suppression and atrophy of the secreting substance. The tendency to-day is more and more toward speaking of the psycho-nervous type—words which do not mean anything, so far as I am concerned. My own observations have led me to follow Poncy and La Rich. I have found many cases of their type, and I asked a young woman, 21 years old, who has all the types and symptoms described in the article by Marcus, to be here to-night. He found that in a large number of his cases there was an enteroptosis present. We all know that the type of enteroptosis in young children, 10 to 16 years old, is always connected with latent tuberculosis of the organism. In this case the young woman of 21 has been married one year. She has had dysmenorrhœa since she first menstruated. She has curvature of the spine, movable kidney, sensitive retroperitoneal glands, increase in the size of the thyroid gland, and a dysmenorrhœa which compelled her to seek relief. The injection of five milligrams of tuberculin produced decided reaction in the arm. She tells me her married life is not happy because she does not care for sexual intercourse. Dysmenorrhœa is an affliction which interests not only the gynecologist but also the general practitioner and all those who have to do with conditions which pertain to tubercular toxæmia, and that is a very wide area of territory. This condition should be thoroughly understood by the family physician before any other methods are re-

sorted to; at least, it should be determined whether the patient is afflicted with tuberculous toxæmia. The only proof of tuberculosis present in the organism is the tuberculin test, and it should be adopted more and more by the specialist and by the general practitioner.

DR. C. S. BACON: I think the paper of Dr. Doederlien very well represents the condition of all gynecologists in that it manifests groping for light on the subject. I don't think he will claim he has reached very satisfactory conclusions or classifications. It is certainly very discouraging that this very important subject is so much in the dark. The observations of Dr. Wiener I believe are very valuable. We have undoubtedly to consider two phases, the various local conditions, sometimes those connected with the uterus, sometimes those with the adjoining organs, enteroptosis, and so forth; and we have also to consider the influences that come perhaps by means of the blood and from other organs, the ovary, the thyroid, and probably from other ductless glands. That is one set of conditions that has to be considered, and, on the other hand, we have to consider the central nervous system, its reaction to various peripheral influences, and that certainly cannot be disregarded. If we dislike the term psychic, hysterical, at least we must admit that there is a good deal of difference in the nervous organisms of individuals. Some are much more sensitive to all sorts of pain than others, and we must admit that that is a very important element in this affection. For my part, I look at that first now, rather than to the local condition. The illustrations that were given of women that were cured temporarily by taking vacations show that the local conditions are not of importance, and if it is possible for us to institute a system of making the body less sensitive, that could be done with great advantage. We cannot always send women away on vacations, and sometimes that would do no good, but at any rate we could help them by measures that could be adopted at home, and that is a feature that is of the most importance, especially to young women. If the local conditions can be helped by simple measures we are accomplishing a great deal. While occasional operations for local treatment may be of value, still those are rather to be considered later, after the other measures have absolutely failed.

DR. DOEDERLIEN (closing the discussion): I see that Dr. Wiener holds the opposite views from me in so far as he represents the material side of the dysmenorrhœa question, and I the nervous or neurotic side. I think we ought to follow the golden mean, even in this matter. In the particular case that I had so much trouble with I gave the patient two months' treatment with the tuberculin test, but there was never a trace of temperature. I believe there must be toxæmia in many types present which is produced through long-continued neuroses.

An investigator by the name of Dolcha reported a long series of cases where he gave thyroid extract. I think he gave two grains three times a day, with remarkable results. As a matter of fact, I still believe in spite of Dr. Wiener's very learned views on this question, that there is a host of cases in which we cannot find a material basis, and which we must put down as psychical or neurotic, or whatever you will. It is a hypersensitiveness of the nervous system. I see, to my satisfaction, that Dr. Bacon holds the views of most of the observers in Germany. I was over there recently and questioned a few of the doctors.

AMERICAN COLLEGE OF SURGEONS

HISTORY, ORGANIZATION, METHOD OF SELECTING FELLOWS

HISTORICAL

The American College of Surgeons was organized at a meeting held in Washington on Monday evening, May 5, 1913. Four hundred and fifty surgeons of the continent of North America came together at the invitation of an Organization Committee which had been appointed by the Clinical Congress of Surgeons of North America at its meeting in November, 1912. This committee consisted of Edward Martin of Philadelphia, Emmet Rixford of San Francisco, John B. Murphy of Chicago, Rudolph Matas of New Orleans, Albert J. Ochsner of Chicago, Charles H. Mayo of Rochester, Minn., Frederic J. Cotton of Boston, George Emerson Brewer of New York, J. M. T. Finney of Baltimore, W. W. Chipman of Montreal, George W. Crile of Cleveland and Franklin H. Martin of Chicago.

The invitations, which resulted in this large gathering of surgeons in Washington, were extended by the Organization Committee after a carefully prepared campaign in which each large university city on the continent was visited by a member of the committee who met, in person, a group of selected men brought together by a committee of three in each locality, which committee had been authorized by the Organization Committee to extend an invitation to the surgeons in their locality to meet the representative of the Organization Committee. These five hundred men who were invited to the meeting in Washington, four hundred and fifty of whom responded, represented all branches of surgery and surgical specialties.

ORGANIZATION

At this meeting in Washington, called for the purpose of effecting an organization, the Committee on Organization presented a definite tentative plan, which plan included a call of the meeting, the presentation of by-laws, the presentation of resolutions, and a plan for the completion of the organization by the election of governing bodies and executive officers.

CALL OF THE MEETING

The men were called together by Edward Martin, Chairman of the Organization Committee, who called for the reading of the Call of the Meeting.

The Call of the Meeting was read by Franklin H. Martin, Secretary of the Committee. This call, which is herein quoted in part, summarizes the work for which, in the opinion of the committee, the American College of Surgeons should stand·

"First. It should formulate a minimum standard of requirements which should be possessed by any authorized graduate in medicine who is allowed to perform, independently, surgical operations in general surgery or any of its specialties.

"Second. It should consider the desirability of listing the names of those men who desire to practice surgery and who come under the authorized requirements.

"Third. It should seek the means of legalizing under national, colonial, state, or provincial laws, a distinct degree supplementing the medical degree, which shall be conferred upon physicians possessing the requirements recognized by this law as necessary to be possessed by operating surgeons.

"Fourth. It should seek co-operation with the medical schools of the continent which have the right to confer the degree of M. D. under the present recognized standards, and urge these colleges to confer a supplementary degree on those of its graduates who have, in addition to their medical course, fulfilled the necessary apprenticeship in surgical hospitals, operative laboratories, and actual operative surgery.

"Fifth. It should authorize and popularize the use of this title by men upon whom it is conferred, and its use should especially be urged in all directories of physicians in order that the laity as well as medical men may distinguish between the men who have been authorized to practice surgery and those who have not."

The founders' organization was completed by the election of a chairman and a secretary, and the authorization of an order of business. The meeting then proceeded to complete the organization by adopting by-laws, rules and regulations and electing governors, regents and officers.

BY-LAWS

I. NAME. The name of the corporation shall be the American College of Surgeons.

II. OBJECT. The object of the College shall be to elevate the standard of surgery, to establish a standard of competency and of character for practitioners of surgery, to provide a method of granting fellowships in the organization, and to educate the

public and the profession to understand that the practice of surgery calls for special training, and that the surgeon elected to fellowship in this College has had such training and is properly qualified to practice surgery.

III. THE COLLEGE. 1. The College shall consist of all members of the corporation. Such members are to be designated as Fellows. The College shall vest the general management of the corporation in a Board of Governors. The Board of Governors shall in turn vest the details of the management in a board of trustees to be known as the Board of Regents.

2. The College shall hold an annual meeting on the day and at the place selected for the annual meeting of the Board of Governors.

IV. BOARD OF GOVERNORS. 1. The original Board of Governors shall consist of the surgeons invited by the Organization Committee to serve as founders of the College, who have qualified as Fellows. The members of this first Board of Governors shall also be known as the Founders of the American College of Surgeons.

2. The original Board of Governors shall be divided by lot into three classes to serve one, two, and three years respectively. At the annual meeting in 1914, and at the annual meeting in each year thereafter, the Fellows of the College shall elect (in a manner to be determined by the Board of Regents) fifty surgeons from among the Fellows of the College to membership on the Board of Governors, each to serve for a term of three years; thirty of these members are to be elected from a list of nominations, consisting of three members each, nominated by the following fifteen surgical associations and societies of North America, and one each from United States Army and United States Navy.

1. American Surgical Association.
2. Surgical Section of the American Medical Association.
3. Section on Obstetrics, Gynecology and Abdominal Surgery of the American Medical Association.
4. General Surgical Division of the Clinical Congress of Surgeons of North America.
5. Division of Surgical Specialties of the Clinical Congress of Surgeons of North America.
6. American Gynecological Society.
7. Southern Surgical and Gynecological Association.
8. Western Surgical Association.
9. Section on Surgery of the Canadian Medical Association.
10. American Association of Obstetricians and Gynecologists.
11. American Orthopedic Association.
12. American Association of Genito-Urinary Surgeons.
13. American Laryngological Association.
14. American Ophthalmological Society.
15. American Otological Society.

Twenty members shall be elected at large to represent surgeons of North America not affiliated with the above societies or associations. In case of failure of any of the above named organizations to make its quota of nominations, or in case of duplication of nominees, the Board of Regents shall nominate members from among the Fellows at large for the vacancies so caused in the list of nominees. The Board of Regents shall in the same manner fill all vacancies in the current membership of the Board of Governors due to death, resignation, or other causes.

3. The Board of Governors shall at its first meeting elect from among its own membership twelve who shall be members of the Board of Regents; this group shall be divided into three classes of four members each, whose terms of office shall expire in one, two and three years respectively. As the term of service in each class expires, their successors shall be elected, each for a term of three years. Not more than three of each class shall be selected from one country. In the event of death or resignation of any member of the Board of Regents, his successor shall be elected at the next regular or special meeting of the Board of Governors, but the Board of Regents may appoint a member of the Board of Governors to serve as Regent until this election takes place.

4. The Board of Governors shall meet in executive session annually for the transaction of business, which business shall include the election of members of the Board of Regents and the election of officers as provided in Article IV, Section 3, and other routine business which may be brought before it by the corporation or the Board of Regents. Such meetings shall be called by the Secretary at the direction of the Board of Regents. Special meetings of the Board of Governors may be called by the Secretary at any other time at the request of the Board of Regents. Members of the Board of Governors shall be expected to attend other formal meetings and convocations called by the Board of Regents for the purpose of conferring fellowships and the transaction of other business.

5. Fifty members of the Board of Governors shall constitute a quorum for the transaction of business.

V. OFFICERS. The officers of the College shall be a President, a First Vice-President, a Second Vice-President, a Treasurer and a General Secretary. Such officers shall be elected by the Board of Governors from among the Fellows of the College, each for a term of one year, and shall serve until their successors are elected. The President, the General Secretary, and the Treasurer shall upon their election to office become members of the Board of Regents.

(*a*) The President shall preside at all regular and special meetings of the College and of the Board of Governors and at all convocations for the conferring of fellowships.

(*b*) The Vice-President shall preside at all meetings of the College in the absence of the President, and in the event of the death or resignation of the President, shall assume the duties of that officer.

(*c*) The General Secretary shall keep all records of the Corporation, of the Board of Governors and of the Board of Regents, shall mail to the proper addresses all notices of regular and special meetings of the College, of the Board of Governors, and of the Board of Regents, and shall have a general supervision of the business affairs of the Corporation under the direction of the Board of Regents.

(*d*) The Treasurer shall receive all funds of the College and disburse the same on checks, signed by him and countersigned by the Secretary. He shall make a report in writing to the Board of Regents at each meeting of that Board of the moneys received and expended, and shall furnish a detailed statement of the financial condition of the College at each annual meeting of the Board of Regents. The Treasurer shall furnish a bond to the Board of Regents for the faithful performance of his trust.

(*e*) In the event of the death or resignation of the General Secretary or Treasurer, the Board of Regents shall elect his successor from among the members of the Board of Governors to serve until the next annual meeting of the Board of Governors and until such time as his successor is elected and qualified.

VI. Board of Regents. 1. The Board of Regents shall consist of the President of the Corporation, the General Secretary of the Corporation, the Treasurer of the Corporation, and twelve members of the Board of Governors elected as hereinbefore provided.

2. The duties of the Board of Regents shall be those ordinarily performed by a board of trustees, namely: the transaction of all detail business devolving upon the Board of Governors in carrying out the object of the organization; the regulation and conserving of its property interests; the creating, appointing, and directing of all standing committees; the election of Fellows to the College; the calling of all meetings of the Corporation not already provided for; the arrangement of convocations or other meetings for the conferring of Fellowships; the transaction of all business not otherwise provided for, that may pertain to the Organization.

3. The officers of the Board of Regents shall be a Chairman and a Secretary.

(*a*) The Chairman of the Board of Regents shall be elected from among the members of the Board of Regents for a term of one year and shall preside at all meetings of the Board. In the event of his death or resignation, the office shall be filled by election at the next meeting of the Board.

(*b*) The General Secretary of the Corporation shall be the Secretary of the Board of Regents.

4. The Board of Regents shall elect the following committees: 1, Credentials; 2, Standardization of Fellowships; 3, Legislation; 4, Graduate Schools and Hospitals.

(*a*) Each standing committee shall consist of five members, the Chairman of which shall be a member of the Board of Regents. The other four members may be selected from the Board of Governors or from the body of Fellows of the College.

(*b*) Other standing committees may be elected from time to time by the Board of Regents.

5. Eight members of the Board of Regents shall constitute a quorum for the transaction of business.

6. Regular meetings of the Board of Regents shall occur once in six months on the call of the Secretary. Special meetings may be convened at any time by the Secretary, or on a request to him made in writing and signed by thirty members of the Board of Governors, or eight members of the Board of Regents.

VII. Fellows. 1. The Fellows of the College shall be graduates in medicine who are licensed to practice medicine in their respective states and provinces, or medical officers of the federal services, who have made an application for fellowship (such application being endorsed by three Fellows of the College, one of whom shall be a member of the Board of Governors), who meet the qualification requirements that shall from time to time be established by the Board of Regents, and who shall be elected to fellowship by the Board of Regents on recommendation of the Committee on Credentials, and who shall have signed the roll.

2. Each individual elected to Fellowship in the College shall be designated as a Fellow of the American College of Surgeons and shall be authorized and encouraged to use the letters F. A. C. S. after his name on professional cards, in professional directories, and in articles published in surgical literature.

VIII. Fees. An initial fee of twenty-five dollars shall be required of each member of the College on his election to Fellowship by the Board of Regents. A fee of five dollars shall be required each year for five years. A payment of fifty dollars at entrance shall relieve the member of further payments.

IX. Publications. The Board of Regents shall issue each year a directory containing the names and addresses of the Fellows of the American College of Surgeons arranged by states, provinces, and colonies.

X. Any member of the College may be expelled for conduct which in the opinion of the Board of Regents is derogatory to the dignity of the College or inconsistent with its purposes. Such expulsion must be voted by a majority vote of the whole Board of Regents at any meeting, to which meeting the member against whom charges are made shall be invited to be present, and may appear or may be represented, in a manner to be determined by the Board of Regents.

XI. These by-laws may be amended by a majority vote of those present at any regular or special meeting of the Board of Governors, or at a meeting called for the purpose on request made in writing by a hundred members of the Corporation, provided that such proposed amendments are included in the call of the meeting at which such action is contemplated.

OFFICERS

President, J. M. T. Finney, Maryland; First Vice-President, W. W. Chipman, Quebec; Second Vice-President, Rudolph Matas, Louisiana; Treasurer, Albert J. Ochsner, Illinois; General Secretary, Franklin H. Martin, Illinois.

BOARD OF REGENTS

J. M. T. Finney, Maryland; Albert J. Ochsner, Illinois; Franklin H. Martin, Illinois; George E. Brewer, New York; George E. Armstrong, Quebec; John B. Murphy, Illinois; Edward Martin, Pennsylvania; Frederic J. Cotton, Massachusetts; Herbert A. Bruce, Ontario; Charles F. Stokes, Pennsylvania; William D. Haggard, Tennessee; George W. Crile, Ohio; Robert E. McKechnie, British Columbia; Charles H. Mayo, Minnesota; Harry M. Sherman, California.

SELECTION OF FELLOWS

It was determined by the organization to admit surgeons to fellowship under two groupings: First, the charter members, consisting of surgeons of distinction and ability who have been in the practice of medicine not less than eight years and who, in the opinion of the Board of Regents, should be entitled to fellowship without the formality of an examination; second, those who should be required to submit to an examination or other test of qualification required by the Board of Regents. It was decided to limit the time of admission of the first group or charter members to November 1, 1914, and to postpone the admission of Fellows by examination until the Board of Regents had formulated detailed plans of a satisfactory nature for admission by this method, not earlier than November 1, 1913.

APPLICATION FOR MEMBERSHIP

The Board of Regents at its earlier meetings announced that it would be the spirit of the association to open the fellowship to all competitors in surgery without favor. The Board of Regents is anxious to have every surgeon on the continent, who can fulfill the membership requirements, become a Fellow of the organization. The General Secretary is therefore instructed to send application blanks to any legally qualified practitioner of medicine on the American continent who may signify his desire to become a member.

METHOD OF SELECTING FELLOWS

The by-laws specifically state that the Fellows of the College "shall be graduates in medicine who are legalized to practice medicine in their respective states or provinces and who meet the qualification requirements that shall from time to time be established by the Board of Regents."

The application blanks are uniform and each applicant for membership is required to file an application blank filled out in detail and signed. The blank contains the following questions:

Name. Address. Place and date of birth.
What school, academy, college or university did you attend? Date of graduation? Degrees?
What medical college or colleges did you attend? Date of graduation? Degrees?
In what hospitals have you been an interne, resident, or assistant? From ——— to ———?
In what hospitals have you been a staff member and in what capacity?
In what teaching capacity have you been active?
What other appointments have you had?
What post-graduate studies have you pursued in America and where?
What post-graduate studies have you pursued abroad and where?
What official positions have you held?
How many years in special practice and where?
What department of special practice?
What percentage of your work is surgical?
What research or experimental work have you done?
Of what medical societies are you a member?
Give the names of five prominent surgeons as references, at least three of whom are from your own state.
Give the names of books and contributions to medical and surgical literature of which you are the author, with date and place of publication.

Signed ———

Date ———

The application papers contain a separate declaration against the practice of fee-splitting. This is in the nature of a personal pledge, and each applicant is required to attach his signature to it and file it with his papers.

This declaration is prefaced by an explanatory preamble that reads as follows:

At the meeting in Washington, when the American College of Surgeons was founded, the question was asked whether the College would positively exclude surgeons who were suspected of fee-splitting or paying commissions in any form whatsoever. The President declared that no one should be admitted who was suspected of being guilty of this pernicious practice. Th declaration was received with universal and most enthusiastic applause.

It does not seem possible that many men who would otherwise be eligible can belong to the class of fee-splitters, but the fact that the matter was so much emphasized has induced the Committee on Credentials to prepare the following positive declaration, which will be filed in connection with the credentials of each Fellow.

If the College succeeds in eliminating this evil, the public will be enormously benefited.

Very respectfully,

COMMITTEE ON CREDENTIALS.

DECLARATION

I hereby promise upon my honor as a gentleman that I will not, so long as I am a Fellow of the American College of Surgeons, practice division of fees in any form; neither by collecting fees for others referring patients to me, nor by permitting them to collect my fees for me; nor will I make joint fees with physicians or surgeons referring patients to me for operation or consultation; neither will I in any way, directly or indirectly, compensate any one referring patients to me; nor will I utilize any man as an assistant as a subterfuge for this purpose.

Signed ———

Date ———

REFERENCE BLANK

While the by-laws require that an applicant give three endorsers, the Committee on Credentials now recommends that five names be given, three of which should be from the applicant's own state. The reference blank contains the following:

Name. Address. College and date of graduation.

1. How long have you known the applicant?
2. What is his surgical standing in the profession?
3. What is his experience as a surgeon?
4. How extensively does he specialize?
5. What special training in surgery has he had?
6. What is his moral standing in his community?
7. What is his ethical standing?
8. Do you believe he will carry out in practice the spirit of the enclosed declaration?
9. Do you believe from your knowledge of the applicant's life that we can accept in good faith his fulfillment of the principles involved in the enclosed declaration if signed by him?
10. Do you believe he is in every way qualified for Fellowship in the American College of Surgeons?
11. Remarks.

COMMITTEES ON CREDENTIALS

The Board of Regents has authorized Committees on Credentials consisting of the Central Committee, which reports directly to the Board of Regents, and State and Provincial Committees, which report to the Central Committee on Credentials.

The Central Committee on Credentials holds its meeting in the office of the College, where the members can have access to all papers and correspondence filed in connection with each candidate.

The State and Provincial Committees, each consisting of from five to seven members, are located in nearly every state in the United States and in four divisions of Canada.

DUTIES OF COMMITTEES ON CREDENTIALS

The name of each applicant for fellowship, together with the names of his references are sent by the Central Committee on Credentials, to the State or Provincial Committee which has jurisdiction over the territory in which the candidate resides, and this local committee, after consideration, makes its recommendations to the Central Committee.

When an applicant's papers are complete, including a report from each of the references given and from the State Committee on Credentials, the Central Committee on Credentials takes up the application for final consideration and recommendation.

When the candidate has successfully passed the final scrutiny of the Central Committee on Credentials, he is recommended to the Board of Regents for election to fellowship. If, on the other hand, the candidate's papers are found defective or his qualifications are considered below the standard for fellowship required by the College, the Committee on Credentials notifies the candidate to that effect.

ACADEMIC ROBE

After careful consideration of the matter and in view of the fact that important convocations at which new Fellowships will be conferred will occur each year, the Board of Regents adopted a distinct fellowship gown which, in their opinion, will add dignity, uniformity, and academic distinction to the formal gatherings of the College.

The gown adopted consists of a body of navy blue mohair. A scarlet velvet facing, five inches wide, extends around the neck and down each side of the front. The cap is of the same material as the gown, with a scarlet tassel.

MASS MEETING WITH REPORT OF THE BOARD OF REGENTS OF PROGRESS

A mass meeting of the Fellows of the American College of Surgeons was held at The Bellevue-Stratford, Philadelphia, June 22, 1914. The meeting was called to order by President Finney at four o'clock. In the following address he outlined the purpose of the meeting and called upon one after another of the Regents to explain what had so far been accomplished by this organization, and what the Regents had in view for the future conduct of the College:

"It was thought best by the Board of Regents to call this informal meeting in order that we could discuss, man to man, the affairs of this College.

"The Board of Regents have not forgotten the fact that we are your servants, not your masters, and we are here to give an account of our stewardship. We want you to know everything that is to be known about the affairs of this College; it is your right, and we are here for that purpose. It was thought that this could best be accomplished by having a few short talks about the various aspects of the College, which it appears, from the letters, requests, and questions that have been received by the Board of Regents, are not clearly understood; it was thought that these matters could best be explained in this manner.

"After these few talks we will throw the meeting open for a few minutes for questions that may not be covered by speeches of the afternoon. We want in this way to give you all the information that we possess. This is not a close corporation. This is your organization, formed by the surgeons of Canada and the United States for a distinct purpose. That purpose, let it not be forgotten, is first and foremost the good of humanity, and next the uplift of the profession. As we conceive it,

those two propositions always go together; there is nothing antagonistic about them.

"The ideals of this organization you already know. I want to tell you that we, as an organization — as the governing body of this organization — have lived up to them to the best of our ability. If in any way we have failed, it is not because we have not tried, but it is because of circumstances over which we have not had complete control.

"I will not take the time to recite these ideals. They were stated as positively and definitely as it was possible to state them at the first convocation. We are endeavoring in every way we can to live up to our ideals now, and we will in the future. What do we hope to do? I am not going to take the time myself to state or recite our hopes and aspirations, as others will do that better than I.

"What have we accomplished? While we are yet rather young, and have not accomplished a great deal, judging from the reports coming in from all over the country, by letter and by word of mouth, I believe we are accomplishing a great deal. Indeed, I believe it is a fact that we have already accomplished more than it was reasonable to hope could be accomplished in a given time. What we hope to accomplish in the future will be stated by others.

"To whom is credit due for what has already been done? I want to take this opportunity to express my personal appreciation of the work of the individual members, individually and collectively, of the Board of Regents. It has never been my privilege to work with quite so disinterested a body of men, men who have had so much at heart a great cause, as this particular body of men, with whom it has been a great pleasure and privilege to be associated.

"I want to take at this time an opportunity to say that to one perhaps more than any other, Dr. Franklin Martin, is due the credit for what has been accomplished. I want to bear witness at this time — he is here and would not want me to say what I am going to say—but I feel that I owe it to you as an organization, and to him as an individual, to say that I have never seen any one show greater devotion or more singleness of purpose or more unselfishness than he has in the work he has done for the American College of Surgeons.

"We have set for ourselves a great task, greater really than we appreciated when we began. How can this be accomplished? It can be accomplished in one way only. In the first place, by the confidence that you, as individuals, have in the ability of this organization to do the work which it has set out to do. If we are confident that it can do the work, then the work is more than half done. I want to thank you on behalf of the Board of Regents for the confidence—the extraordinary confidence—that has been shown by the Fellows of this organization in the present management. It is appreciated by all of us.

"This work cannot be done without the means to do it. We are confident that this organization can carry on its work, can accomplish the aims and objects in the minds of the founders — but we must have the means with which to carry it on.

"A question that is going to be answered presently is, 'What are you going to do with all this money?' And that reminds me of a story: A colored man who was recently married met a friend on the street, who said: 'Sam, how are you getting on?' Sam said, 'Getting on bad.' 'Why, what is the matter?' 'I am worried about my wife all the time wanting money: yesterday a quarter, to-day fifty cents, and to-morrow she will want a dollar.' 'Well, Sam, what are you going to do about it?' 'Well, she hasn't got any yet.'

"We are not worried about what we are going to do with the money; what we are interested in now is getting it. You will hear something about the plans we have in mind — and they are big ones — We will account for every cent we get, later on.

"Now I am going to call on the other men, one after the other, to speak to us. I am going to call on Dr. Oschner and ask him to tell us about the money and the prodigious work of the Committee, which has had much to do with the selection and determining as to the qualifications of those who are to be members of this organization."

The report of the finances of the College was read by Dr. Ochsner:

CREDENTIALS COMMITTEE REPORT

Dr. Ochsner also outlined the work of the Committee on Credentials:

"For the work of the Credentials Committee, I will say that no member of the Committee had any idea of the extent of the work that would be necessary to investigate the credentials of the proposed members. The Committee is composed of four of the leading men in the surgical profession in the city of Chicago, each being a professor in one of the largest colleges, and each one at the head of a department of surgery in one of the principal hospitals. They are men whose names I am not permitted to give but they are men whom all of you know. I mention this fact, because you can place yourself in their position and imagine yourself giving one evening, from seven o'clock until towards midnight, once a week throughout the entire year, to the work of the Credentials Committee; and these men, together with Dr. Martin, who is not on the Committee, but who was present constantly to help out the Committee, were present at fifty meetings, each lasting at least four hours a day. Taking the union labor day of eight hours they have given 25 full days during this year to the work of this Committee.

"Now, as to the character of the work: Every one of the applications passing through their hands has been scrutinized and every word of every application gone over; first the application, then the report of the State Committee, then the report of

all references. Then if there was anything concerning any one of these items that contained the slightest doubt, this matter was immediately discussed by the entire committee and not dropped until some conclusion had been reached. The conclusion was either that the applicant was entirely unfit, or that the references were not clear enough, or that some portion of the references was so vague as to require further investigation; or that there was some prejudice on the part of some member who had furnished information or that the objection was not valid and that the applicant should be passed.

"Undoubtedly of the two thousand applications that have not been acted upon favorably as yet, there are many that should have been acted upon favorably had it not been for the fact that one of these elements raised some doubt or question in the mind of one of the members of this Committee. Not one single name has been passed so long as there was any doubt in the mind of any member of this Committee, and I will say not a man on this Committee has shown the slightest prejudice to any name. Every case was handled entirely upon its merit.

"This work has required an enormous amount of correspondence, and in many instances a package of answers to the inquiries an inch or two high have been received which have sometimes left the Committee more thoroughly muddled than before. Many of these names undoubtedly should have gone in during this convocation, but in many instances it was not possible for all of the members to decide favorably and we adhered to the rule that the decision must be unanimous; there must be no doubt left. That may account for the rule that in a number of your home towns you will find some colleague whom you want to be a member and who has not been favorably acted upon. He may be some one who you might say is better qualified than you are or more so than some man in a neighboring town whose credentials have been satisfactorily passed upon; but so long as there was any doubt in the mind of any one of the Committee, the name could not be passed favorably and it was filed away for future consideration.

"I wish to make some suggestions to the members of the College for the purpose of facilitating this work. There are, as we have stated, some two thousand names not acted upon favorably. In some of these cases the credentials on their face were so defective that they have not even come to the hands of the Committee. The very efficient secretary of our committee examines every one of the credentials and after finding defects, at once sees to their correction, if possible, by writing for explanations from those who have sent in vague or otherwise defective references.

"Now, what should you do to help clear up the other credentials and facilitate the work, so that all those who are eligible can be passed upon by our committee before November?

"First, we would ask you to give the necessary amount of time to determine just what you should say regarding these applicants. These colleagues of our committee have given 25 full days of their time. Why should you not give a few hours to make sure you know something definite about a man? We send you these reference blanks and ask you to send in a report. Why should you not give a sufficient amount of time to know absolutely what to say to us about the candidate? Just give the required amount of time, and if you don't know the applicant, see some Fellow of the College who does know him.

"Secondly, we ask you to be positive. Do not be indefinite. If a statement comes in indefinitely prepared some member of the Committee will say, 'If that man were all right in every particular this reference would be definite.' We have repeatedly spoken of this in our communications, but we will ask all Fellows once more to be definite.

"Thirdly, we will ask you to leave everything personal out of the question. It does not make a bit of difference what difficulties you have had with this man or that man whose application comes into your hands, you should handle it fairly. It is of no importance, so far as the writing of the letter is concerned, if he be your worst enemy but has the qualifications, the enmity should not influence the answers in the slightest difference. We have found in a number of instances that we could not act favorably simply because there has been some personal animosity.

"Fourthly, we wish to impress upon you that the membership of State Committees cannot be made public at the present time, because it would expose the members to endless annoyances by unworthy men. And so we will ask the State Committees to apply to the Fellows and ask them to send in reports to them, and they in turn, will report to us. When such a request is made, take the time to go and see a man personally; talk the thing over with him and find out where he stands; then tell us just what you think about it.

"Regarding the work of the State Committees for the future, I would say the same thing that I have said to the Fellows, with this addition: When our committee is willing to give one day a week to this work, we think it reasonable to expect the State Committees to give one day a month. Have a monthly meeting; work ahead, assigning this name to this man and that name to that one, and have them come in and make a monthly report. I am sure you will get as much satisfaction out of it as our committee has. The more they work, the more enthusiasm they show over the work, the more they feel that it is worth while. This thing is our baby, and naturally, Dr. Martin and I do not mind being up nights with it. We have gotten these other men of the Credentials Committee to walk the floor with it with the same grace, so that we hope every one of you will join in the same spirit.

"To illustrate what has repeatedly happened, I will quote one case: We had an application from a man who was graduated from one of the greatest

universities, and from one of the best medical schools. He had taken service in one of the biggest hospitals in the country, and settled in the middle of a state, and never made much ado about it. He had an enormous practice and looked after it well. The State Committee sent back a report on this man 'Unknown.' If one of them had taken the time and made an appointment with that man to see some of his work, he would have sent back a statement that this man was one of the best prepared men in the entire state.

"So I would ask each one of you to adopt and care for this baby, at least for the time that we put it in your arms."

LOCATION OF PERMANENT HOME

Dr. Stokes, as Chairman of the Committee on Permanent Location, made the following report:

"Our President has requested me as chairman of a committee for the selection of a location of a home for the College to lay before you what progress has been made by this committee.

"In order carefully and conscientiously to consider the question of the locality best suited for the site of the home, naturally the aims and policies of the College must figure in the problem.

"We have organized and the success in organization has exceeded the rosiest of expectations. The methods of organization have been severely criticized in some quarters, but in every great undertaking there must be a start; and if, as some of our critics unhesitatingly say, many mistakes have been made, the future will take care of them.

"You will hear men say that this or that man ought not to be a Fellow of the College. To these I have said, 'Give me proper and sufficient grounds and I shall spare no effort to see that he or they cease to have any further connection with this organization.'

"Thus far there has been no response from any one. If the membership in certain societies and associations in surgery and the specialties were drawn upon and as a result some possibly unqualified individuals were improperly honored with Fellowships, as alleged, it seems to me that the onus falls upon the societies and associations to which these men were accredited and not on the College.

"As you are well aware the College is organized; the next problem is administration, and this to my mind is the paramount issue confronting us to-day. As we are planning very largely for the future, much thought and deliberation and no undue haste should be exercised in outlining our administrative policies.

"What are the aims of the College? Primarily, to help those in need of surgical treatment, which will best be accomplished by uplifting the standards of surgery, and by making the ideals and policies of the College felt in the undergraduate schools, graduate schools, and hospitals, large and small. The best work is not confined to the great clinics. Excellent work is done in some of the small hospitals; others should be encouraged to raise the standard of their work and equipment. It should be the duty of the local committees on credentials to seek out and encourage the properly qualified, remotely located surgeon by honoring him with a Fellowship, or by inviting him to qualify. Dr. Ochsner has just told you of a man in a western state who was reported by the local committee as unknown, but when further investigated at the suggestion of the central committee was found to have had exceptionally good training, was doing good work and was in every way qualified for Fellowship. This spirit should continue.

"The scheme of judging of the qualifications outlined by Dr. Edward Martin in itself will be a stimulus to better work, if impartially and conscientiously carried out. In order that the man who has graduated from an accepted school and has completed his service in an accepted hospital may not be discriminated against during his five-year period of probation, I would suggest that he be permitted to present his school and hospital credentials; and, if satisfactory, that he be allowed to announce his intention to qualify for Fellowship by being accorded some tangible form of declaration.

"Your committee has given several cities careful consideration from many points of view such as geographical centrality, numerical centrality, as well as what might be called itinerant centrality; and while we are not prepared finally to report to the Board of Regents and to you, the consensus of opinion is strongly in favor of Washington, D. C.

"Washington is neutral ground, and with the home of the College located in this capital city, the activities of this great organization would be free from the suspicion of being controlled by any school, university, or group of individuals, or by medical and other politics.

"Here a great congress of physicians convenes every third year; here over one hundred and fifty continental and national organizations have located their homes. In my opinion it is too early in our career to plan for a specific size and type of building. Why not, if Washington is to be selected, try the locality out for a time at least in temporary quarters until we are prepared to say along what lines we are to develop in the home. We should have at an early date an administrative headquarters where records can be kept, board meetings be held, and other work of the College be carried on; and these quarters should be in keeping with the dignity of this great institution. We could then after mature deliberation decide whether or not we are to develop a surgical museum, whether or not we are to duplicate a great medical library already existing there, and whether or not we are to have a great convocation hall or make use of one now under construction as occasion may demand, and further consider many other problems that will confront us.

"I feel that the College with its high ideals has come to stay for all time and that no undue haste should be indulged in planning for its future. Those of us who have had to do with some of its early problems

will have passed away before this organization will have attained its full strength and have made its influence for good fully felt. Let our motives stand out so clearly and clean-cut that a Fellowship shall be the aim of every young surgeon, and those who are now standing in doubt on the side lines will unhesitatingly fall in line and join hands with us in this great humane endeavor."

ENTRANCE REQUIREMENTS

The general plan under consideration by the Committee on Examination, or future entrance requirements, was outlined by Dr. Edward Martin, Chairman of this Committee.

"Our first tendency, after the formality of organization and the securing of a sufficient number of strong men to make it potent, is to make entrance requirements which in themselves shall be a gauge of capacity. This, if wisely planned, assures for this Society a future of potentiality and usefulness beyond our present power of imagination. We want the young men coming on to be better equipped and trained, stronger, and more able than ourselves.

"Probably every one who has traveled and attended the clinics returns with a great admiration for the work done there, and with a settled conviction that if a surgical operation must be performed on himself or any member of his family, he will come home and have it done; for it is characteristic of the American surgeon that he sees the immediate need of things and goes swiftly and deftly for it. We want the coming American surgeon to be still better than is he of the amphitheater to-day — to play a larger part in the progress and advancement of surgery. Therefore, we propose for this great body a scheme of entrance requirements, not based upon an examination, of which we have a surfeit, but rather upon an investigation into the efficiency of the work he does with his head and hands.

"We propose the ordinary requirements in regard to ethical standing, academic education, and hospital residenceship, and some special study under the charge and direction of men of acknowledged skill and large clinical experience.

"The applicant must have served at least one year as a hospital interne or house officer, preferably in a hospital with varied service.

"He must have served at least three years as a second assistant, or one year as a first assistant, to a surgeon of recognized ability and with an adequate hospital service, and must supplement his individual report of operations by a further report of at least a hundred cases in which he has thus acted as assistant.

"He must show evidence that he has visited other surgical clinics than those to which he has been officially appointed.

"He must give a list of his publications, indicating those which he has in the course of preparation.

"In addition to this, he must show some work done for the advancement of the general cause of surgery.

"Finally, he must give a report of his own work showing fifty consecutive cases of major operations done by himself — mark the word consecutive — with the names and addresses of the patients, the names and addresses of the physicians or consultants referring the cases, the pre-operative diagnosis, names of the anæsthetists, the anæsthetic given, quantity and time of administration, a brief description of the operation with a note of the time required for its performance (calculated from the first cut to the beginning of the application of the dressing), the post-operative course and the mention of its complications, if such have occurred (not only those conditions usually classed as such, but consecutive bleeding which calls for measures directed toward its control, hæmatoma of sufficient extent to require evacuation or drainage, or suppuration as slight as a stitch abscess, are to be regarded as complications), the condition of the patient on discharge from the hospital, with subsequent course of case up to date of application for membership to the College, or as near this as seems practicable.

"Each day he works he is preparing for admission, and his summarized records enable the Committee on Admission to judge of the accuracy and efficiency of his work. This means no expenditure of time in preparing for foolish examination. It means that we admit men fit for their work. It means a simple American solution of the question of establishing a standard for admission to a body of practical working men."

REPORT OF GROWTH AND FUTURE FINANCIAL NEEDS OF THE COLLEGE

Dr. Franklin H. Martin presented a summarized budget, which represented the future financial needs of the College, in which he said:

"Eighteen months ago, in New York, the American College of Surgeons was conceived; thirteen months ago at Washington it was organized; six months ago in Chicago it conferred fellowships upon 1,050 surgeons, and to-night it will confer 1,055 additional fellowships; in November next, it will confer fellowships on the balance of the Charter Member list of applicants, bringing the whole number to near the three thousand mark.

"What is the meaning of this almost superhuman effort on the part of the busiest surgeons of this continent to organize a College of Surgeons that has eventuated in deeply impressing and enrolling in its membership in twelve short months, more than two thousand of the most thoughtful surgeons of two great countries? Whatever motives may be attributed to such a movement by the casual or careless observer, it is only necessary to join its ranks, become a part of it, and know the character of the men who have worked for its success, to be convinced that a great vision of unusual opportunities for bettering the surgery of America, rather than the establishment of an ornamental guild, has been the compelling force in the minds of all who have been allied with this remarkable movement.

"To-day, we have come together as Fellows and prospective Fellows of the American College of Surgeons to make another forward move. We have assembled, as charter members, the actual founders of an organization that is to parallel a similar organization which has had an honorable career in our mother country for a thousand years. Our Fellows as surgeons, surgical specialists, and citizens will be represented throughout our continent in every university as teachers, in every hospital as members of the staff, and in every medical board of state, provincial, or national councils.

"Judging from our standards, the character of our members, the prerogatives we have assumed, and the far-reaching influence that may be wielded by cooperating our energies, our responsibilities are enormous. The compensation for great responsibilities is great opportunities.

"Among our responsibilities we have assumed the standardization of surgery, the standardization of surgeons. To standardize surgery we must cooperate with the graduate and undergraduate teaching institutions of the continent and their hospitals, and aid them in establishing more efficient methods of teaching, and higher requirements. To standardize surgeons we must coöperate with the people who employ surgeons, and establish in their minds the power of discrimination, and thus create a public opinion that will make inefficiency and dishonesty in surgery so unpopular that it cannot thrive.

"We have then the nucleus of a great organization, built on the highest ideals. Our opportunities are obvious. Strong men are back of us, and it now remains for us to demonstrate our ability to administer that which has been placed in our hands.

"The ultimate financial budget of this organization at this time can only be hinted at, because in time we will need the upkeep of a dignified home with libraries, laboratory chiefs, museum curators, executive secretaries, and a corps of assistants, all directed by a competent chief.

"For the immediate future, however, we require a trained educator of executive ability, with a broad vision of the needs of the College, who, under the direction of the Board of Regents, will conduct the executive business of the College and devote his entire time to the work. This head of the College should have a cabinet of surgeons, with whom he should be free to consult at all times, and who with him will constitute the Examining Board of the College. These surgeons should be selected with qualifications as follows:

"First, a surgeon who is actively interested in medical educational problems, especially in reference to the undergraduate medical schools, and who will, indirectly or by coöperation with other organizations, seek to raise the standard of surgical education, and will devote at least one month's time each year to the work of the College.

"Second, a surgeon of similar inclinations who is especially interested in the problem of the graduate medical schools, and who will devote at least one month's time each year to the work of the College.

"Third, a surgeon who is interested in the standardization of hospitals, and who will, by a carefully conducted propaganda, use every effort to bring about specific results in this direction, and who will be willing to devote a definite amount of time each year to the work of the College.

"Fourth, a surgeon interested in medical educational problems, who will be willing to assist in organizing legislative and civic committees in states, provinces, and cities where problems of interest to surgeons are being discussed, and who will be willing to devote time to propaganda work of that sort and to the work of the College.

"The plan of administrative control on some such basis as this, in my opinion, should be put into effect at, or soon after, our November meeting.

"The salary of the chief director should be sufficient to be attractive to any man qualified for the position, who would be free to accept it.

"The four surgeons who are to act as advisers and who, with the director, will be the administrative committee of the College, should receive as compensation a suitable sum per diem for the actual time engaged in College work, and should, in addition, have their traveling expenses refunded. They should be appointed by the Regents and should serve for a definite term of years.

"This committee would formulate rules for admission of Fellows along the lines adopted by the Board of Regents, and would manage the machinery necessary for their admission, subject to the same control of the Regents as the several committees serving at the present time.

"This strong administrative body is an absolute necessity if the College is to begin the work that is before it and pursue it with the intelligence and persistence that will be required to make it an accepted power. It goes without saying that we will have to pay a trained director, who will devote his energies to the College, a suitable salary.

"It is equally true, unless we are to run a philanthropic institution, that the executive committee of surgeons who shall give several weeks each year to our affairs shall each be paid for the actual time devoted to the College.

"These expenses, roughly estimated, including the $10,000 necessary for current expenses, the expenses of the executive officers, will not be less than $35,000 a year. Our income, with our present system of finances, with a membership of three thousand, will be $15,000.

"My estimate of expenses for the work of the immediate future (and this does not include the upkeep of a permanent home), it will be seen, is $20,000 a year more than our income.

"In some way, therefore, we must provide for this immediate need or the College will be curtailed at the outset because of inadequate financial support. If we are to have a dignified home, with libraries, museums, and our own meeting hall, we will require

fully as much as the sum I have named in addition for upkeep and salaries, and this does not take into consideration the initial expense of a building.

"To be safe, independent, and have a financial standing commensurate with the personnel, ideals, and future possibilities of our organization, we should make provision for an immediate permanent income of $50,000 a year. This administrative fund should be the income from a permanent endowment fund, invested in perpetuity for the benefit of the College.

"How shall we raise this endowment? What do we expect to accomplish through the judicious expenditure of the income on such an endowment? Why have three thousand surgeons of this continent been selected Charter Members of the American College of Surgeons? What will future generations of surgeons say when they read over the list of Charter Members of this organization? Will they say: 'Theirs was a happy conception, but they left it to future generations to make it permanent?' or will they say: 'There were giants in those days; men and women of vision, with the courage of their convictions, who knew the pleasure of sacrifice; men and women who planned broadly, and executed magnificently.'"

ENDOWMENT FUND

The urgent need of raising a one-million-dollar endowment fund was presented by Doctor George W. Crile in a few concise remarks:

"This group of men have become Fellows of the American College of Surgeons by virtue of the fact that each has attained eminence in his profession. Every member of this organization is now in the midst of an active producing career. There are in our ranks to-day no young members just starting in their profession. Our present roll is of successful men.

"We owe much to the institutions that helped us in the past. We owe much to the public that gave us the hospitals in which we received our training, and to the medical schools where we acquired our education. It was only through the generosity of high-minded citizens that we were given the opportunity for the scientific training which has made our careers possible.

"The primary purpose of this organization is not so much to help us as it is to help those who follow us. We are, so to speak, preparing an inheritance for our children. After the list closes next November, no one will be admitted to fellowship excepting by an examination. After that time there will always be in this organization groups of young men without means—perhaps still in debt for their education—young men who are making a struggle for existence. As long as this organization exists, there will never again be a time in which all the Fellows will have reached their active, productive period. Therefore, there will never be another time so opportune for offering a privilege in which every Fellow is able to participate.

"Should it not be our greatest honor to have participated in the endowment of an institution of this character? It is common experience that one's greatest interest lies where his greatest sacrifice has been made. The future of this institution will depend not only upon the endowment that we make, but upon the fact that for that endowment we have sacrificed time, thought, and money. By sacrifice in its behalf this organization will become a part of us and it will have a newer and deeper meaning for us.

"The Board of Regents, after due consideration, propose that there shall be circulated, to-day, cards for pledges of $500, payable at some future time.

"Each one of us to-day is proud of the fact that he is a Fellow of the American College of Surgeons, and that pride will be increased if we assure the perpetuation of this institution by our gifts and consecrate it by our sacrifices."

Blank forms had been prepared in advance and were distributed to the Fellows at this time. The pledge, which is in the form of a promissory note, reads as follows:

AMERICAN COLLEGE OF SURGEONS
ENDOWMENT FUND

I hereby subscribe Five Hundred ($500) Dollars to the Endowment Fund of the American College of Surgeons, the amount to be paid as follows:

Jan. 19	.....	.....	Jan. 19	.....	.....
Jan. 19	.....	.....	Jan. 19	.....	.....
Jan. 19	.....	.....	.....	.....	.....

I further agree to pay on this pledge interest on the balances due at the rate of 5 per cent per annum, beginning January 1, 1915. It is further agreed that this subscription shall be void unless the subscription to the Endowment Fund equals $500,000 by December 1, 1914.

Signed.....

Address.....

....., 1914.

Immediately following the distribution of these subscription blanks, Dr. John B. Murphy urged every Fellow of the College to assist in raising this endowment fund. He said:

"This is to us a special privilege day. It is very fitting that this day and its privileges should occur in the City of Philadelphia. But a short distance from here, in Liberty Hall, not so many years ago, a small body of men, bent on a definite purpose, with positive convictions, with inspiration and foresight, founded, for all time, a model of human liberty, that the greatest good might avail to all. Here, to-day, we, as a body of surgeons, should found—on a basis of self-sacrifice, which is substantially the basis on which the founders of our principle of liberty sacrificed not only their wealth but their lives for the principles that they were advocating—a permanent home.

"We are doing that, for what purpose? Not for

benefit to us, but that the lives and the health of the people of this great nation will, in the future, be better conserved than they have been in the past. Remember, the unit around which medical existence, education, and universities revolve, and always must revolve, if we are to continue to have the affection, confidence, and support of the people, is the individual patient. We must render to that individual patient the best service that we have or can possibly obtain. That individual patient is our ward, is our trust, and looks into our eyes feeling that he can depend upon us to exercise the last unit of energy and time and knowledge for him, and we must fulfill his expectations.

"The purposes of this organization have been mentioned to you so clearly to-day, and the question has been asked, 'What has been accomplished?' Wonders have been accomplished, and wonders have been accomplished by a few men because they were willing to sacrifice time and labor for the ideals on which they wish to found this organization. The fact that we have in this hall to-day six or seven hundred men, and to-night will have fourteen hundred, many who have traveled thousands of miles, and many who have come here at a great sacrifice of time and money, is a certificate of the earnestness of the founders of this organization and of the men who are in the organization.

"If this small handful of men, less than a dozen, originally only three, could produce this great result by living and working for an ideal, what can this grand body of American surgeons do for the surgery of the future?

"Gentlemen, that rests with you, collectively, individually. Now, who is willing to stand for the purposes of it, willing to work for its best interests? No one can estimate the great benefit that must come to American surgery and to the American people by our fidelity to the trust which is placed in us.

"We shall be asked to-day, or we have been asked to-day, to contribute to the permanent educational fund of this organization. Do I want to contribute? Do you want to contribute? We were once founding an Orchestra Hall in Chicago. I met a man who knew little or nothing about music, and we were discussing this problem. 'I want to put my name,' this man said, 'on the honor roll of a citizen who is willing to make a sacrifice for the art of music.' That was the true spirit. I feel that every man here wants the honor of being one of the founding members and have his name enrolled with this grand body of men who are going to place to-day the American College of Surgeons on a financial basis that will stand for all time.

"The funds—how will they be cared for? The funds for the present are in the hands of Dr. Ochsner, the treasurer, and his conservatism and name are synonymous with responsibility and trust. He is known all over the world for just such elements as have made him so valuable in the founding of this organization.

"I cannot permit this moment to pass without saying a word for the man who conceived this organization; a man who has stood rebuffs, accusations, and contumely from one shore of this great land to the other; who has shown, in his labor and work, that when one is advocating a true purpose, the more opposition one has, the more the cause will grow and attract the support of the worthy. Opposition to this has come from organized and unorganized forces. The man who has borne the brunt of the labor, who has planned so wisely and well for the American College of Surgeons, who has sacrificed time, money, and personal interest for his ideals, the man to whom the major credit is due, is Dr. Franklin H. Martin. It was his dream. It is our realization. It is now your accomplishment and its future is your responsibility.

"I think I can say for the Regents of this organization that it is the desire of the American College of Surgeons to join hands in the march of progress with every organized and unorganized agency of medicine and surgery. But while it is its purpose to march with them, hand in hand, it is also its determination not to have its course swerved one way or the other by any organization or body of men; not to deviate one iota from the high ideals which have inspired this dream and brought about its fruition.

This was followed by a short talk from Dr. Charles H. Mayo, calling for a liberal response to the request for subscriptions to the endowment fund:

"The organization of this College marks the greatest epoch in the history of American surgery This College is not being developed for our benefit alone, as is claimed by those who object to the organization by saying it has made a classified list. What this country wants more than anything is a classified list of able, honest men in the profession.

"There is nothing in the world really appreciated except that for which sacrifices are made. We appreciate a thing only in so far as it costs personal endeavor. The men on the Board of Regents have worked, and there is no more unselfish worker among them than our General Secretary. It is through his efforts that we have this organization to-day, though we have wanted it for years.

"We cannot expect that the running expenses of this College shall be paid by the young men who will join after this year, because they will not have arrived, and it will not be fair to ask it of them. We owe certain things to the people, and I do not see any better way we can pay our just share for the opportunity that has enabled us to advance and has put us where we are than to do something for the future of our profession. It is a privilege to pay something toward the medical profession to which we belong. This should not be looked upon as a charge. We should not be like the many multimillionaires who before death have tied up their wealth in every possible way. If they had lived in a state in which there was an income tax on their wills, they would have given away their money

before death in order to beat the state. Some of the multimillionaires still living have done well, but some of the dead ones have not done so well. And we don't want to ask these outsiders to help us. We owe it to the profession to help ourselves. This sum of $500 each has been asked for to-day in order to give us a start. There are those who will not see the benefits of this organization for a few years to come, and the Board of Regents must plan some method by which these men, when they do come to their right minds, may join us and do so without humiliation to themselves or to us. Many good men have been led astray as to our motives by some medical journals. In the best journals we have not had a word of criticism.

"I want to impress upon you that this society must go on; that the time is ripe, and that there will be no backward step. If we have made a mistake as a Board of Regents in suddenly deciding to-day to raise money for the future of the organization, then it means more personal endeavor on the part of each one of us to find a new and better plan."

Finally, Dr. W. D. Haggard addressed a few brief remarks asking that the Fellows sign and turn in their pledges at once:

"I do not feel that there is anything I can add here; it seems to me at this moment that it resolves itself into a proposition of raising a million dollars in a few months. I believe it is going to be done; $500 apiece from two thousand surgeons. What is $500 to this group of distinguished surgeons? You will earn it in a few minutes after you get home.

"In all seriousness it seems to me this is an opportunity of a lifetime; it has been hinted that this College would be endowed by some millionaire and we would enjoy it. I feel that we should contribute. We do not need aid, but the people of this country need to have a group of men to whom they can look for succor in time of sickness and distress. The purpose of this College is not to shed luster on the members but on the community. The slogan of this College should be, 'Let no good man be kept out, but let no bad man get in, or stay in.'

"There has been some criticism on the part of those who have not been admitted to fellowship and there has been some criticism on the part of the medical press; but it does seem to me, as I stand here and look into the faces of this cream of the surgical profession of this country, the question is answered for all time; and I feel, therefore, Mr. President, that this opportunity is a transcendent one and every man here can, will, and must sign this pledge for $500."

An informal discussion followed the addresses by the members of the Board of Regents. It was suggested that each five-hundred-dollar pledge to the endowment fund constitute the donor a life member of the College and that his membership fee of twenty-five dollars be credited on his pledge and that the yearly dues provided by the by-laws also be omitted; and, furthermore, that each charter member Fellow who contributed to this fund before December 1, 1914, should be designated in all future editions of the Roll of Fellows a Founder of the College, and that the Board of Regents be requested to provide for such changes in the by-laws as might be necessary to carry out these suggestions, and present the same for approval at the next meeting of the Corporation of the College.

CONVOCATIONS

THE FIRST CONVOCATION

The first convocation of the American College of Surgeons occurred in the Gold Room of the Congress Hotel, Chicago, on the evening of November 13th, 1913.

The prospective Fellows were invited to sign the roll of membership at this place during the day. The roll was furnished in loose-leaf form, and a corps of assistants presided over the formality of signing in a manner to make it possible for a large number to be accommodated in a short space of time. Each page of the roll was headed by a pledge or contract, and to this the Fellow appended his signature and address.

FELLOWSHIP PLEDGE

Recognizing that the American College of Surgeons seeks to develop, exemplify, and enforce the highest traditions of our calling, I hereby pledge myself, as a condition of fellowship in the College, to live in strict accordance with all its principles, declarations, and regulations. In particular I pledge myself to pursue the practice of surgery with thorough self-restraint and to place the welfare of my patients above all else; to advance constantly in knowledge by the study of surgical literature, the instruction of eminent teachers, interchange of opinion among associates, and attendance on the important societies and clinics; to regard scrupulously the interests of my professional brothers and seek their counsel when in doubt of my own judgment; to render willing help to my colleagues and to give freely my services to the needy. Moreover, I pledge myself, so far as I am able, to avoid the sins of selfishness; to shun unwarranted publicity, dishonest money-seeking, and commercialism as disgraceful to our profession; to refuse utterly all secret money trades with consultants and practitioners; to teach the patient his financial duty to the physician and to urge the practitioner to obtain his reward from the patient openly; to make my fees commensurate with the service rendered and with the patient's rights; and to avoid discrediting my associates by taking unwarranted compensation. Finally, I pledge myself to coöperate in advancing and extending, by every lawful means within my power, the influence of the American College of Surgeons.

PROGRAM

8:00 Fellows and guests assembled.
8:15 Governors assembled.
8:25 Regents assembled with honorary guests.
Invocation by the Rev. J. G. K. McClure.
Presentation of the Roll of Fellows and Honorary Fellows by the Secretary.
Conferring of Fellowships by the President.
Introduction of Honorary Fellows individually by the Regents and conferring of Fellowships by the President.
Fellowship address by Sir Rickman J. Godlee.
Presidential address by J. M. T. Finney.
Adjournment followed by reception of the Fellows and Guests by the Officers of the College and Sir Rickman J. Godlee.

CONFERRING OF FELLOWSHIPS

Sir Rickman J. Godlee of London was introduced by Regent W. W. Chipman. Before conferring the degree, the President, Dr. J. M. T. Finney, received the candidate and said:

"Sir Rickman J. Godlee, student, versatile author, distinguished surgeon, worthy member of a family whose name is known and honored wherever antiseptic surgery is practiced, President of the Royal College of Surgeons of England, the highest honor within the gift of his professional associates at home. His presence here is a renewed evidence of the mutual high regard and esteem held for each other by the two great English-speaking nations."

The President then conferred upon Sir Rickman J. Godlee an honorary fellowship in the American College of Surgeons.

William W. Keen of Philadelphia was introduced by Regent George W. Crile. Before conferring the degree, the President received the candidate and said:

"William Williams Keen, nestor of American surgery after a professional life covering fifty-two years. As a leader of the Jefferson School of Philadelphia, he links us with the great professional names of the nineteenth century. Army surgeon, teacher, operater, writer, publicist, traveler, patron, of art, promoter of the best in higher education, public-spirited citizen, recipient of the greatest gifts in American medicine, Honorary Fellow of the Royal College of Surgeons of England and of Edinburgh, he is honored throughout Europe. Wherever good surgery is regarded, there he is quoted."

The President then conferred upon Dr. William W. Keen an honorary fellowship in the American College of Surgeons.

William Stewart Halsted of Baltimore was introduced by Regent Charles F. Stokes. Before conferring the degree, the President received the candidate and said:

"William Stewart Halsted, surgeon, teacher, investigator, honored at home and abroad; contributor to the progress of science. One of the four distinguished founders of the Johns Hopkins School of Medicine. His gifts to surgical technique, to numerous valuable operations now the standard, and to many great advances in surgical physiology and pathology, have brought to him international renown. Honorary Fellow of the Royal College of Surgeons of England and of Edinburgh, with undiminished vigor he still pursues his valuable career."

Following this, honorary degrees were conferred *in absentia* (candidates being unable to attend because of illness) upon J. Collins Warren of Boston and Robert F. Weir of New York.

FELLOWSHIP ADDRESS

Sir Rickman J. Godlee, President of the Royal College of Surgeons of England, was introduced by the President, J. M. T. Finney, and upon rising, was received with prolonged applause, the entire audience rising to greet him. Before reading his formal address, he presented a greeting to the American College of Surgeons, in the form of an illuminated parchment, from the Royal College of Surgeons of England.

GREETING FROM THE ROYAL COLLEGE OF SURGEONS

We, the Council of the Royal College of Surgeons of England, have heard with much interest of the approaching inauguration of the American College of Surgeons. We hereby convey to it our hearty good wishes, and express the hope that it may have a successful career and fill a position beneficial alike to the Profession and to the Community.

We cannot forget the important advances in the Science and Art of Surgery achieved by many distinguished surgeons in the Continent of America during the past, and are proud to have enrolled upon our list of Honorary Fellows the names of some of the most active workers in these fields at the present day.

In accepting the invitation for our President to take a part in the opening ceremony, we desire to show that we appreciate the intention of the American College to strengthen the bonds that already unite the Medical Profession amongst the English-speaking peoples. It is a sentiment which always meets with a cordial response in this country, and it is one which this College will endeavor to support by all the means in its power.

In witness whereof we have caused the Common Seal of the College to be hereunto affixed this 9th day of October, 1913.

President: RICKMAN J. GODLEE.
Vice-presidents: G. H. MAKINS.
[SEAL] FREDERIC EVE.

Sir Rickman J. Godlee then delivered the formal address to the American College.

ABSTRACT OF ADDRESS

In the first place it was pointed out that it is difficult for anyone, and especially for people living in America, to appreciate the conditions in England at the beginning of the fourteenth century. This was near the end of the middle or dark ages. The military spirit prevailed, science was under a dark cloud, and medicine was not in advance of other sciences. Surgery was not so much respected as medicine. Surgeons indeed were classed with barbers and for the most part belonged to the Barbers' Guild, which was formed in 1308. It included those who practiced minor surgery, but the better

class of surgeons held aloof and formed themselves into the Guild of Surgeons.

Reference was then made to the origin of the guilds in the city of London. They were associations or fraternities of artisans for the supervision of the crafts and for regulating the hours of labor. They became important bodies, and elected the Lord Mayor and Corporation.

More than two hundred years later, namely, in 1542, the Barbers' Company and the Guild of Surgeons united and were incorporated as the Company of Barber-Surgeons. This company existed another two hundred years; namely, until 1745. They exercised extensive control over the surgeons of the country. They gave licenses to practice and sometimes deprived surgeons of their licenses; they supervised the public dissections which were the only form of anatomical study recognized by law; they appointed lecturers in surgery, possessed a censorship over books, and had other very important duties. The two bodies were, however, incompatible and in 1745 the Surgeons' Company was separated from that of the Barber-Surgeons. In 1800 they were established as the Royal College of Surgeons in London, and in 1843 the name was again changed, by a charter of Queen Victoria, to that of the Royal College of Surgeons of England.

The College of Surgeons had its first quarters in the Old Bailey, and later on moved to its present house in Lincoln's Inn Fields. The ancient titles of Master, Governors, and Court of Associates were changed to those of President, Vice-President, and Council. The corporation consisted of the members. In 1843 a new class of members who were called Fellows was formed, from and by whom the Council henceforth was to be chosen, instead of being elected by the Council themselves as had been the case up to that date. The first Fellows were chosen from the members, being elected by the Council chiefly from the surgeons, assistant surgeons, and lecturers of the metropolitan hospitals, and they also included representatives of the naval, military, and Indian forces. But since that time the ordinary portal for admission to the Fellowship has been an examination — or rather, two examinations — which constitute a formidable and searching test of ability. The class of Members now numbers over 17,000; the Fellows number 1589.

Reference was then made to the new American College of Surgeons, and to the methods of recruiting its Fellowship. After describing in some detail the examinations above referred to, a contrast was drawn between the English and American Colleges. Some of the other functions of the English College were passed in review, especially that of the discipline which it can exercise over its Fellows and Members. In connection with the examination for the diploma of membership, the question of a uniform system of admission to the medical profession was discussed, and in this connection it was pointed out how in England attempts are being made to secure this result.

In conclusion, the relations of the Royal Colleges of Physicians and Surgeons in London was referred to, and the opinion was expressed that as surgery advances, the tendency will be for these two great departments of the profession to be drawn more closely together.

PRESIDENTIAL ADDRESS

President J. M. T. Finney then delivered the presidential address which has been printed in full and distributed to the Fellows of the American College of Surgeons and to members of the profession. In brief he said:

"The highest development of the greatest efficiency along all lines of public service relating in any way to our profession." With this as the keynote, the American College of Surgeons was launched by Dr. Finney on what is thought by all concerned to be a career of usefulness for the public at large. "The history of surgery in the United States and Canada," said Dr. Finney, "is opened to a new page. When at some future time the historian comes to write on that page the record of events that have led up to this meeting, he will record the taking of another step in the progress of medicine in general and of surgery in particular in Canada and the United States. What is consummated here to-night is destined to produce a deep and lasting impression upon medical progress not alone in those countries but indirectly the world over.

"The present and future welfare of the profession has been for a long time uppermost in the minds and very close to the hearts of many of us. We have pictured to ourselves in this connection a profession ennobled by men actuated solely by their desire to devote their time and their talents to the relief of suffering humanity, willing, yes, glad at any time, if need be, to lay down their own lives for those of their fellow-men; whose membership should embrace only men of singleness of purpose, unselfish, high-minded, zealous in their efforts to wrest from nature the keys to her many mysteries; men who unconsciously, perhaps, in character and conduct, reflect in varying degree the life and spirit of the Great Physician; a profession free from taint of commercialism or graft, in which there shall be no room for the base, the unscrupulous, the ignorant, or unskilled; in which the test for membership has to do only with character and attainment.

"Our hopes and dreams, so long dim, shadowy, and unreal, are about to assume definite and concrete form. We are assembled here this evening to witness, indeed to assist, at the birth of a new agency for good, both to the public and to the profession; to bid Godspeed to this lusty infant, the American College of Surgeons, the offspring of a fruitful union between a deep-rooted and praiseworthy desire within the profession to elevate its standards of ethics and efficiency, and a lively sense of the urgent and long-felt need of its accomplishment.

"The aim of this organization and the reason for its existence lie in its disinterested and unselfish

efforts to elevate the standards of the profession, moral as well as intellectual, to foster research, to educate the public up to the idea that there is a difference between the honest, conscientious, well-trained surgeon, and the purely commercial operator, the charlatan and the quack; furthermore, that the term 'surgeon' means something more than a suave manner, a glib tongue, a private hospital, a press-agent, and the all too easily acquired diploma, with its accompanying title of 'doctor.' The standardization of surgery is absolutely essential to guard the public against such as these, as well as to preserve the honor of the guild itself. So far as the public is concerned, it is necessary to protect it from those who would prostitute their high office for gain, from the ignorant and the untrained, from those who by reason of the lack of surgical judgment and skill are incompetent. The American College of Surgeons has been called into being as an active, vigorous, virile protest upon the part of the profession against this unhappy state of affairs.

"The public and professional minds should therefore be at once thoroughly disabused of any wrong impression that the College is to be run by any one man or set of men, or by or in association with any pre-existing organization for his or their personal gain or aggrandizement. The American College of Surgeons is no surgical trust, no close corporation for the benefit of the few. It plays no part whatever in medical politics; it does not interest itself in the advancement of any corporation or group of individuals, nor in any special school or cult of medicine. It stands only for the good of humanity and the uplift of professional standards."

THE SECOND CONVOCATION

The second Convocation of the American College of Surgeons was held in the ballroom of The Bellevue-Stratford, Philadelphia, on the evening of June 22, 1914. Here Prospective Fellows were invited to sign the membership roll during the day.

PROGRAM

8:00 Fellows and Guests assembled.
8:10 Governors assembled.
8:20 Candidates for Fellowship assembled.
8:25 Regents assembled with Honorary Guests.
Invocation by Bishop Philip M. Rheinlander.
Introductory remarks by the President.
Presentation of the Roll of Candidates for Fellowship by the Secretary.
Conferring of Fellowships by the President.
Introduction of Honorary Fellows individually by the Regents and conferring of Fellowships by the President.
Fellowship Address by Dr. James G. Mumford.
Concluding Remarks by President, J. M. T. Finney.
Adjournment, followed by an informal reception.

CONFERRING OF FELLOWSHIPS

Dr. Edmond Souchon of New Orleans was introduced by Regent Rudolph Matas. Before conferring the degree, Dr. J. M. T. Finney received the candidate and said:

"Edmond Souchon, American of French descent, himself of the best French training. Eminent as a teacher, anatomist, surgeon, sanitarian, and original contributor to the literature and technical advancement of his profession. Ingenious in devising graphic methods of illustration in the teaching of anatomy. Founder and organizer of an unrivaled museum of anatomical, surgical, and pathological dissections, all prepared in a masterly fashion with his own hands, and mounted and preserved with extraordinary effectiveness by methods of his own invention. Conspicuous in surgery—among other enduring contributions by his monumental history of the subclavian artery and its lesions,—he exemplifies the highest ideals of the great Southern school in connection with which his life's work has been done."

Dr. Francis J. Shepherd of Montreal was introduced by Regent Frederic J. Cotton. Before conferring the degree the President received the candidate and said:

"Francis John Shepherd, author and teacher for over forty years, a conspicuous figure in the world of surgery. Educated in the best professional schools of his own country and abroad. Representative of the highest culture and best traditions of the Canadian school. Recipient of the highest honors here and at home, Honorary Fellow of the Royal College of Surgeons of England."

An Honorary Degree was conferred *in absentia* upon Dr. Thomas Addis Emmet, whose name was presented by Regent W. D. Haggard. The President said:

"Thomas Addis Emmet, a Virginian born and reared, whose distinguished work has been done in the North. A survivor of the antebellum surgery, he himself has entered fully and successfully into the modern era. One of the first and best known of American gynecologists, as an operator, writer, teacher, and practitioner, he was a leader far beyond his own generation of the surgical giants of our America in the nineteenth century."

FELLOWSHIP ADDRESS

Dr. James G. Mumford of Clifton Springs was introduced by President J. M. T. Finney, and delivered the fellowship address.

Concluding remarks by President Finney. Adjournment was followed by an informal reception.

APPLICATIONS FOR FELLOWSHIP

Nearly four thousand applications for fellowship in the College had been filed up to June 1, 1914. Of this number the Committee on Credentials recommended to the Board of Regents 1,059 for fellowship at the first convocation, and 1,055 at the second convocation. A large number of the applications still on file will undoubtedly be found to represent successful candidates, when they have been considered by the Committee.

FUTURE CONVOCATIONS

The Third Convocation and the annual meeting will convene in November, 1914, the date and place to be announced later.

FELLOWSHIP ADDRESS

THE PRACTICAL AND THE IDEAL

By JAMES G. MUMFORD, M. D., F. A. C. S., Clifton Springs, New York

LET us admit that this is a workaday world. It is a region in which practical persons are placed to get things done. But it is a world of ideals also, and without ideals the practical man is as naught. In politics, in literature, in the arts and in science we must see the end and a proper purpose, else our practice is but as ashes between the teeth. Great purposes call for great men. If we cannot all be great, let us at least strive for that leveling up which the democratic shibboleth teaches—for indeed leveling there must be; and let us agree with Carlyle that gallant purposes and heroes are not all dead. One recalls a spirited passage from that trenchant writer: "I am well aware that in these days hero-worship . . . professes to have gone out and finally ceased. This . . . . is an age that, as it were, denies the existence of great men—denies the disirableness of great men. Show our critics a great man, a Luther for example: they begin to, what they call, 'account' for him; not to worship him but take dimensions of him,— and bring him out to be a little kind of man! He was the 'creature of the Time' they say; the Time called him forth; the Time did everything, he nothing but what we, the little critics, could have done too! This seems to me but melancholy work. The Time called forth? Alas, we have known Time to *call* loudly enough for the great man, but not find him when it called."

Now observe that great *purposes*, great *endeavors*, as well as heroes, draw the same words from the critics. We are met here with a fine and genuine purpose, and after much endeavor. Is it nothing that we strive to elevate and to dignify the calling of surgery? Is it nothing that we see our shortcomings, and strain after better things? Is it nothing that some of the best minds in America have lent themselves to these thoughts, and that hundreds of us have come together with earnest purpose? Our censors, a dwindling band, may cry out that we are a company of idealists, and that we shall accomplish no practical object. Let us examine this matter somewhat; and that our ideals and our practice be clear in our own minds, let us submit ourselves first to the chill of definitions:—

An idealist;— what is he? An idealist I take to be a man who strives after perfection. An idealist is not a visionary. A visionary is a man who seeks the impossible. All great men have been idealists, and all great purposes ideals. Julius Cæsar was an idealist; so were Augustine and Columbus, Hildebrand and Alfred, Erasmus and Vesalius, Cromwell and Cavour, Washington and Robert Lee, Edison and Eliot,— but these men were sound practitioners as well. Who, then, shall define the *practical man* if we must divorce the practical man from the idealist, and bring them up by hand in separate groups. Are practical men those who are conscious of their own incapacity — the corner grocers of life, the mere children of routine? Such persons do pride themselves on being practical. Disraeli makes Coningsby say of them: "In the language of this School, a practical man is a man who practices the blunders of his predecessors."

There is the story of the Irish farmer who took his thirty pounds of butter in to the market at Cork — butter loaded on a donkey, one saddle-bag holding the thirty pounds of butter, the other balancing with thirty pounds of stone. To the inquiring friend who asked why he did not balance and lighten his load by putting fifteen pounds of butter in each bag, Patrick retorted in displeasure: "Me grandfather loaded this way; and what was good enough for him is good enough for me."

But let us not rule the practical man out of count. I take it that the proper practical man is that sane idealist with wit and knowledge to bring his plans to fruitage. There is the bogus practical man and there is the true practical man — two personalities always to be distinguished. Mark them: The *bogus* practical man is the man without vision and so without ideals. Such a man can never be truly successful in this land. His purposes are not ours. At bottom we are a nation of idealists. All our history shows it. The bogus practical man is the smug, shrewd fellow who sees some occult knavery in the acts of his neighbors; whose own temperament is knavish; to whom the word "service" is a word of derision; whose sole purpose is his own advancement and the accumulation of dollars. That is his word of words, and he will tell you that money is power. We used to be told that *knowledge* is power. Now, my friends, we who know the world know that this sort of practical man, this self-centered man, this bogus fellow, is a fool. He does not acquire knowledge; he does not acquire friends; he does not acquire power; commonly he does not acquire money. Rarely do we hear of him beyond the corner on which he plies his trade. Yet he sneers at honest men as idealists and as visionaries.

The true practical man, on the other hand, sees that genuine success, that distinguished purposes, can be reached only through frank coöperation, through organized effort, through community benefit, through generous competition. These qualities, these tools of progress, stand for and bring those good things which the bogus fellow seeks vainly through his methods of a crude individualism.

In our own case, when we increase our collective efficiency, when we render a fuller and more honest public service, when we secure and confirm the respect of the community, by so much not only shall we improve the status of our profession, but we shall strengthen immensely our own individual cases as members of that profession. The fatuous civil laws governing biological research in Great Britain; the degraded imbecility of the judge in the recent animal-experimentation case here in Pennsylvania; the mortifying and ignorant encomiums of the daily press when dealing with occasional medical affairs, and their equally offensive howls when they have conceived cause for rebuke,— all these may be matters for our silent scorn and derision. But such a situation is not a happy and stimulating situation. Instead of being thankful for the rare discriminating silence, we should look for intelligent appreciation, judicious interest, restrained and balanced support. As has recently been written of us,— we repeat it modestly, I trust,—"When the intellectual history of this time comes to be written, nothing will stand out more strikingly than the empty gulf in quality between the superb and richly fruitful scientific investigations that are going on and the general thought of other educated sections of the community." The deep fundamental reason for the value of scientific work is that as a class we scientific men honestly seek the truth. Instinct and

experience teach us that lacking the truth established with every forward step, our progress would be vain. In that, we differ from all the others—the metaphysicians, the clergy, the lawyers, the writers: they are partisans and advocates; they hold their briefs. And so perhaps the greatest function that science as a whole has to perform is the setting up of high standards, thus teaching to men square dealing, straight seeing, just thinking, truth-telling, and temperance in statement, in precept, and in practice.

Much of this may sound like preaching, but my argument is driving at this: that we here, as members of this College, have an opportunity, collectively and individually, to uphold standards and to forward greatly a branch of science which appeals peculiarly to all men. More than others of our kind, we are continually in the public eye; and so much the greater is our responsibility.

Let us admit humbly, that we of this College encounter skeptics and critics in the medical profession and even in our own ranks. Let us meet their criticism by performance. These doubters tell us sundry unpalatable things—that we represent a local group; that they have axes to grind; that some persons are cat's-paws; that our organization is an imitation; that we cannot influence the community; that bad surgery will flourish in spite of us; that pernicious fee-splitting cannot be eliminated; and that we assume a "holier-than-thou" attitude which will alienate good men.

While much of this talk is carping and jealous, still, much of it is honest, and we should not disregard it. Let us sift it for a moment: The allegation that we are a local group disproves itself at once. Glance at our list of officers and Fellows—and it will be seen that we represent the honest surgery, general and special, of the continent. That criticism of parochialism at least is not well-founded. We hear it said that there are axes to grind. Who shall say? We trust not. The criticism is so general and so nebulous that it cannot be answered specifically. The same charges are made against all voluntary associations. In a sense they all have axes to grind. If not, why should they exist? But who shall define that ax-grinding purpose? If critics mean that we propose to improve American surgery, to amend our individual status, to hold incompetents at a distance, perhaps to influence the public, as well as state and federal legislation,—doubtless the ax-grinding charge is true. But we are not exclusive; all honest, competent men and women, after proper scouting, are to be admitted to our ranks. This ax-grinding charge, so far from showing moral turpitude, represents an honorable ambition. As to the cry of "cat's-paws," Who are the designing ones, and who are the dupes? The personnel of our well-known and distinguished Board of Regents renders that cry ridiculous. Then we are charged with being an imitation of the English Royal College. Why not? That is an excellent model; in fact, however, the charge is absurdly untrue. Our method of incorporation, our lack of grading, our numbers, and our form of government and administration disprove the statement.

There remains the one serious and adverse charge: that we cannot influence for good the profession and the community, and that our purpose is chimerical.

That is a matter for our earnest consideration. I have already referred to it. What do our critics mean by this cloudy prognosis? They tell us that a stream cannot rise higher than its source — a true saying and worthy the literary acumen of these doubters. Such a statement in this connection

would be ludicrous did it not show a pathetic ignorance of life and of historic values. Proverbs and legends fortunately do not rule the world. No progress in human affairs ever would have been made had our race sat supine waiting for the source to elevate itself. And who are these fellows that prattle of sources? The sources of human endeavor, I take it, lie in human needs; and those sources are raised by united human effort following the prophets and the gallant leaders. Are we to admit now that foresight and courage have been lost from among us?

Again, what *are* the sources of good American surgery? Where are they to be sought? Our critics talk as though these sources were to be found in the weary rank and file, among the general practitioners, among the overdriven and the less expert. Shall we admit this? Shall we look there for our sources, much as we admire and respect these much over-worked men? In all human activities, indeed, we demand a high general average if distinguished action is to evolve; but the true sources are to be found in the fountains and not in the low-lying springs. The sources of all distinction lie in the precepts and in the examples of leaders. And these leaders need for their fullest development sympathetic human stimulus and human appreciation. The teacher without a following falls fallow; the most devoted scientist — even a Fabre — without pupils and an audience, eventually will relax. All this means, and history shows, that a competent, well-trained, earnest body of men, with definite, practical objects in view, and under distinguished united leadership, invariably succeeds. So much for our leading purpose — the maintaining of high and honorable standards.

How is the community to profit? Obviously, by the steady raising of our surgical standards and ethics; but especially, by the recognition and the practice of having their surgical dealings with a company of men and women united jealously to guard and to maintain those standards and those ethics. The time must shortly come when all men shall recognize the letters of our diploma as a genuine sign manual.

Here, perhaps, is the place in which I might be expected to say some word on the subject of fee-splitting — that evil practice against which we have set our faces. A few words such as I have previously spoken must suffice. What is fee-splitting? *It is the buying and selling of patients.* The public knows little of this naughtiness. Even if you explain, they see little wrong. Fee-splitting is practiced at times by the merchant, the shopkeeper, the clergyman, the lawyer, the farmer, and the mechanic. Obviously, it means a commission, a bonus, or a "rake-off" for the good will, the good word, or the friendly act of a fellow-craftsman. But fee-splitting in ordinary business is a mild offense, or no offense at all, and differs from medicosurgical fee-splitting in this: that in ordinary business the customer is not necessarily made to suffer, because there is commonly a recognized fixed charge for commodities and for service. The customer knows this and counts upon the inevitable profit of the middleman. If a farmer can produce eggs for fifteen cents a dozen, and if the customer pays the grocer thirty cents a dozen, there is no secret connivance anywhere in the transaction. Thirty cents is the market price, and the customer knows that the fifteen cents profit is somewhere properly divided between the farmer and the intervening grocer. The same rule is recognized as proper and true of other commodities. The public, knowing the market prices, expects to allow for reasonable profits, and expects to pay more than the

cost of production. Medicosurgical fee-splitting is another matter and occupies a bad position peculiarly its own. It is graft; it is blackmail by the general practitioner; it is bribery by the guilty surgeon. Through such transactions the unscrupulous surgeon *buys* his patient from the unscrupulous family doctor as surely as he buys flour from the grocer. *Fiat justitia, ruat cœlum. Again, let us scan our ethics, and let the crusade advance.*

Finally, there is that "holier-than-thou" reproach. How are serious and self-respecting men to meet such an accusation? If a man tells me that I am a donkey, no amount of argument will convince him to the contrary. That's a point of view. We set a standard, and we try to live up to it. We may fall short of our ideal; but that is no argument for setting no standard at all.

As one stands here looking into the faces of this great company, moved by a common object, shall not one feel stimulated to an expression of hope and purpose, even though the spirit of prophecy no longer walks freely abroad? Without purpose and a genuine program no enterprise shall long endure. But *we shall* endure, and there are reasons for our conviction:

First, we plan, as has been so often said, to set a high standard for American surgery. We have already admitted those men only who gave proofs. By proofs we do not mean necessarily the mere writing of papers for medical journals — that fatuous and exaggerated test of ability, which may or may not be evidence of worth. By proofs we mean the faithful, daily routine care of the sick, using the best methods, applying the best technique, accommodating our hands to the facile use of our tools; but more than all, through study, through devotion, through self-effacement, through whole-hearted probity, through staging the scene always for the patient and never for the operator, to develop that elusive and rare product of common sense, known among the elect as surgical judgment. We do not open our ranks to men of age and wide experience only. We recognize eagerly the contributions of progressive and accomplished young surgeons. The diplomas of their schools, hospitals, and states certify to their right to practice. A few years of further independent experience qualify them for our examinations and admission to the College. We count on their interest and support; every one of them must join us, for on them shall depend finally our future, and the success of this endeavor. We must not neglect to do missionary work among them. We are weary, wary, and experienced in many things. They are fresh, unreflecting, and joyous; but they too must assume the *toga virilis* and the burdens. So shall they mature in an atmosphere of purpose and resolve.

Secondly, it is not too early for us to be considering matters of state and national legislation. Collectively we can bring to bear on lawmakers our convictions regarding animal experimentation, questions of public health, quackery, legal responsibility, and medicolegal abuse, especially those standards of surgical education which shall qualify a man to take in hand the lives of his fellows. For this surgical responsibility is a great and pressing matter, and grows more serious as years pass. The old imperative surgery, which dealt mainly with the removal of tumors, the healing of fractures, the relieving of obstructions, and the checking of hæmorrhage, was a relatively simple thing, and was readily comprehended by the courts.

The modern surgery of choice, which deals as well with tissue reconstruction, with repair, with the problems of physiology and chemistry, with the restoration of function, with normal growth and development, and finds itself concerned with all the organs of the body, irrespective of their vital significance,— this new surgery demands surgeons of special training, of wide learning, qualified in technique, grounded in the humanities, versatile, patient, wise. The work of such men, the intricacy of their problems, the results of their judgment and the outcome of their labors are not to be measured by foot-rules, to be weighed against dollars, or to be gauged by callow juries. Justice and equity call for reform in medicolegal practice.

Thirdly, we have already bound ourselves to discountenance ethical evils. By that we mean especially the division of fees. But there are other things. Observe, as I have said elsewhere, that there is a feeble and fatuous word, *etiquette*, by which the unthinking are wont to cloak the noble qualities of ethics. Alas! that such a Turveydrop semblance should have been given a precedence by feeble minds; that the outward and visible sign should push aside the inward and spiritual grace.

Ethics signified originally *character*. It deals philosophically with conditions which affect the human family for good or ill. *Etiquette codifies* the superficial relations which govern men in the drawing-room or the club. Ethics directs that there shall be honor among gentlemen; etiquette, that they shall tread softly and wear evening dress. Hippocrates marked the distinction. That great man, in his oath, struck at the root of the matter, and like St. Paul himself, gave us rules that shall prove sound through all time.

Good ethics, then, is to be found among surgeons who, following the teaching of Hippocrates and Aristotle, of Celsus and Galen, maintain that he is the upright scientist who pursues his art by the light of sound reason; who draws his conclusions and guides his practice by deductions founded on accurate observation; who observes that clear inductive method which is older than history; who abhors exaggeration and pretense; who practices square dealing; who conducts himself toward his fellows and toward the public as a generous and honorable man.

Fourthly, to the end that these and other good things may be the more effectively and securely accomplished, it has seemed to the far-seeing men who conduct our affairs that this College should have a permanent physical foundation — a home of its own. Wherever such a home may be placed, its almost imperative need and value are apparent. Beneath its roof should be gathered our essential equipment: a dignified hall for convocations; suitable examination rooms for our candidates; proper offices; social meeting rooms; a proper library of current and periodical surgical literature, which should also house and protect the many objects of historic value which time shall store in our archives; and perhaps also, a carefully selected and representative museum.

Through such means a home for the College will prove pleasant and profitable, but this home will be of far the greatest value to us as a human center, as a common meeting ground for men embarked in a common pursuit. Indeed, we have come strongly to believe that without this meeting ground our purposes and our enterprise itself may come to naught. We men are gregarious creatures; we have our customs, our habits, our folkways, and our modes of speech. We say that in undertaking this College

we have a common purpose—and yet, as a rule, we know little of each other. We often live far apart; we view the world and its details from different angles; we have our local notions, prejudices, ambitions. Experience of civil life in a democracy teaches us how easy it is for men with a common purpose, but without a common background, to drift apart, to cultivate antagonisms, to form parties. Even among men of science, and of clear perception, these things have been troublesome in the past. To differ in opinion is our human attribute; but among us, differences should not bar the horizon; they should lead merely to effectiveness — provided we come to know and understand each other. Acquaintance, friendly knowledge, good fellowship,— these are pleasant and comfortable experiences, and through them, cultivated beneath a common international roof, let us believe we shall unite effectively for the work we have in hand.

Such are some of our immediate purposes, and such are some of the thoughts, obvious enough, which come to mind as one views the future.

Mr. President and Fellows, the American College of Surgeons has been the hope of idealists for more than a generation. Now after two years of practical effort we see it accomplished. With Horace, fervently let us say:

"*Labitur et labetur in omne volubilis ævum.*"

FELLOWS OF THE AMERICAN COLLEGE OF SURGEONS

The following list contains the names of the surgeons upon whom fellowships in the American College of Surgeons were conferred at the first convocation on November 13, 1913, and at the second convocation on June 22, 1914. Nineteen hundred applications are in the hands of the Committee on Credentials. These will be considered as rapidly as the documents are completed. Other applications for this Charter Member group will be received until November 1, 1914. Successful candidates will receive their fellowships at the convocation to be held in November, 1914.

HONORARY FELLOWS

Thomas Addis Emmet	New York
Sir Rickman J. Godlee	London
William S. Halsted	Baltimore
W. W. Keen	Philadelphia
Francis J. Shepherd	Montreal
Edmond Souchon	New Orleans
J. Collins Warren	Boston
Robert F. Weir	New York

UNITED STATES OF AMERICA

ALABAMA

J. Norment Baker	Montgomery
John Howard Blue	Montgomery
Louis Edward Broughton	Andalusia
Herbert Phalon Cole	Mobile
K. W. Constantine	Birmingham
John D. S. Davis	Birmingham
Charles Edward Dowman, Jr.	Birmingham
W. Earle Drennan	Birmingham
Francis G. DuBose	Selma
J. N. Furniss	Selma
James A. Goggans	Alexander City
Wyatt Heflin	Birmingham
W. T. Henderson	Mobile
L. L. Hill	Montgomery
Robert Somerville Hill	Montgomery
Harry T. Inge	Mobile
William R. Jackson	Mobile
W. M. Jordan	Birmingham
S. Kirkpatrick	Selma
James Monroe Mason	Birmingham
William McDowell Mastin	Mobile
Alfred Edward Maumenee	Mobile
Paul Stearns Mertins	Montgomery
Lewis Coleman Morris	Birmingham
Lloyd Noland	Birmingham
Henry Stanford Persons	Montgomery
Mack Rogers	Birmingham
Edward W. Rucker, Jr.	Birmingham
Malcolm Daniel Smith	Prattville
C. A. Thigpen	Montgomery
Isaac Lafayette Watkins	Montgomery
William Hinton Wilder	Birmingham
Cunningham Wilson	Birmingham

ARIZONA

John Elmer Bacon	Miami
E. Payne Palmer	Phoenix
Francis Eppes Shine	Bisbee
Clarence Edgar Yount	Prescott

ARKANSAS

St. Cloud Cooper	Fort Smith
R. C. Dorr	Batesville
William V. Laws	Hot Springs
Charles Forrest Perkins	Springdale

CALIFORNIA

Clark L. Abbott	Richmond
Lemuel Payson Adams	Oakland
Frank C. Ainley	Los Angeles
Eliot Alden	Los Angeles
Thomas E. Bailly	San Francisco
J. Henry Barbat	San Francisco
Shadworth Oldham Beasley	San Francisco
David A. Beattie	San Jose
William Ellery Briggs	Sacramento
J. Mackenzie Brown	Los Angeles
Rexwald Brown	Santa Barbara

HAROLD BRUNN . . . . . San Francisco
ERNEST ALBERT BRYANT . . . . Los Angeles
GUIDO E. CAGLIERI . . . . San Francisco
WALTER C. CHIDESTER . . . . San Mateo
VERNON GREENE CLARK . . . . San Diego
GUY COCHRAN . . . . . Los Angeles
EDWARD T. DILLON . . . . . Los Angeles
ALFRED LAWRENCE DRAPER . . San Francisco
WILLIAM A. EDWARDS . . . . Los Angeles
H. BERT ELLIS . . . . . Los Angeles
EDWARD N. EWER . . . . . Oakland
FRED R. FAIRCHILD . . . . . Woodland
ERNEST W. FLEMING . . . . . Los Angeles
ELISHA TOLMAN GOULD . . . . Sonora
JOSEPH UNDERWOOD HALL . . . San Jose
OLIVER D. HAMLIN . . . . . Oakland
CHARLES REES HARRY . . . . Stockton
CARLOS G. HILLIARD . . . . . Redlands
LAWRENCE H. HOFFMAN . . . San Francisco
HENRY HORN . . . . . San Francisco
HENRY W. HOWARD . . . . . Los Angeles
THOMAS W. HUNTINGTON . . San Francisco
SOLOMON HYMAN . . . . . San Francisco
EDMOND M. LAZARD . . . . . Los Angeles
ROBERT THOMAS LEGGE . . . . McCloud
CHARLES G. LEVISON . . . . San Francisco
WILLIAM REINHARDT LIVINGSTON . Oxnard
ANDREW STEWART LOBINGIER . . Los Angeles
CHARLES D. LOCKWOOD . . . . Pasadena
GRANVILLE MACGOWAN . . . . Los Angeles
WILBUR W. MACKENZIE . . . . Los Angeles
ARCHIBALD LYLE MACLEISH . . . Los Angeles
FITCH C. E. MATTISON . . . . Pasadena
GEORGE J. MCCHESNEY. . . . San Francisco
ALLEN BONNER MCCONNELL. . . Fresno
HENRY MEYER . . . . . San Francisco
FRANK W. MILLER. . . . . Los Angeles
E. C. MOORE . . . . . Los Angeles
M. L. MOORE . . . . . Los Angeles
LEWIS B. MORTON. . . . . Los Angeles
HENRY P. NEWMAN . . . . . San Diego
CHARLES EATON PHILLIPS. . . . Los Angeles
WALTER B. POWER. . . . . Redlands
W. W. RICHARDSON . . . . . Los Angeles
EMMET RIXFORD . . . . . San Francisco
LEON JOSEPH ROTH . . . . . Los Angeles
RAYMOND JOHN RUSS . . . . . San Francisco
HENRY ANTHON LEWIS RYFKOGEL San Francisco
HENRY HOWARD SHERK . . . . Pasadena
HARRY M. SHERMAN . . . . San Francisco
HAROLD SIDEBOTHAM . . . . Santa Barbara
REA SMITH . . . . . Los Angeles
GEORGE BURBANK SOMERS . . . San Francisco
STANLEY STILLMAN. . . . . San Francisco
D. C. STRONG . . . . . San Bernardino
DUDLEY TAIT . . . . . San Francisco
WALLACE IRVING TERRY . . . San Francisco
ISAAC WALTON THORNE . . . San Francisco
JEAN JAQUES ABRAM VAN KAATHOVEN Los Angeles
C. VAN ZWALUWENBURG . . . . Riverside
W. E. WADDELL . . . . . Los Angeles
W. FRANCIS B. WAKEFIELD . . San Francisco
JAMES THOMAS WATKINS . . . San Francisco
ALANSON WEEKS . . . . . San Francisco
WILLIAM WILLIAMSON . . . . . San Diego
WM. LEMOYNE WILLS. . . . . Los Angeles
O. O. WITHERBEE . . . . . Los Angeles

COLORADO

MELVILLE BLACK . . . . . Denver
RICHARD WARREN CORWIN . . . Pueblo
LEONARD FREEMAN. . . . . Denver
THOMAS J. GALLAHER. . . . . Denver
WILLIAM W. GRANT . . . . . Denver
CASPER FRANK HEGNER . . . . Denver
CLARENCE BANCROFT INGRAHAM, JR Denver
EDWARD JACKSON . . . . . Denver
WALTER A. JAYNE. . . . . Denver
SAMUEL FOSDICK JONES . . . . Denver
MAURICE KAHN. . . . . Leadville
LORENZO B. LOCKARD. . . . . Denver
OLIVER LYONS. . . . . Denver
FRANCIS H. MCNAUGHT . . . . Denver
GEORGE B. PACKARD . . . . . Denver
CHARLES A. POWERS . . . . . Denver
CHAUNCEY E. TENNANT . . . . Denver
HORACE GREELEY WETHERILL . . Denver

CONNECTICUT

ARTHUR N. ALLING. . . . . New Haven
GEORGE NEWTON BELL . . . . Hartford
JOHN B. BOUCHER . . . . . Hartford
DAVID CHESTER BROWN . . . . Danbury
GEORGE M. BURROUGHS . . . . Danielson
WILLIAM HENRY CARMALT . . . New Haven
JOHN WOOLMAN CHURCHMAN. . . New Haven
JOHN WELLINGTON FELTY . . . Hartford
JOSEPH MARSHALL FLINT. . . . New Haven
THOMAS NORVAL HEPBURN . . . Hartford
RUSH W. KIMBALL. . . . . Norwich
EDWARD RUTLEDGE LAMPSON. . . Hartford
EVERETT JAMES MCKNIGHT . . . Hartford
CARL E. MUNGER . . . . . Waterbury
SELDOM BURDEN OVERLOCK. . . . Pomfret
ALFRED M. ROWLEY. . . . . Hartford
E. TERRY SMITH . . . . . Hartford
EDWARD WIER SMITH . . . . . Meriden
OLIVER COTTON SMITH. . . . . Hartford
PAUL PLUMMER SWETT . . . . Hartford
CHARLES EZRA TAFT . . . . . Hartford
WILLIAM FRANCIS VERDI . . . . New Haven
ERNEST ALDEN WELLS. . . . . Hartford

DISTRICT OF COLUMBIA

Edward A. Balloch	Washington
Rupert Blue	Washington
William Cline Borden	Washington
J. Wesley Bovée	Washington
William C. Braisted	Washington
Joseph Hammond Bryan	Washington
W. P. Carr	Washington
Virginius Dabney	Washington
John Dunlop	Washington
William G. Erving	Washington
Harry Atwood Fowler	Washington
Henry D. Fry	Washington
Francis Randall Hagner	Washington
A. Barnes Hooe	Washington
Howard Hume	Washington
Virgil B. Jackson	Washington
Joseph Taber Johnson	Washington
Harry Hyland Kerr	Washington
Robert Scott Lamb	Washington
Huron Willis Lawson	Washington
Louis C. Lehr	Washington
Francis B. Loring	Washington
Thomas Leslie Macdonald	Washington
Ernest Pendelton Magruder	Washington
G. Brown Miller	Washington
James F. Mitchell	Washington
John F. Moran	Washington
Charles Malden Oman	Washington
Edward Mason Parker	Washington
Danial Webster Prentiss	Washington
Luther Halsey Reichelderfer	Washington
Charles W. Richardson	Washington
J. J. Richardson	Washington
Stephen O. Richey	Washington
John Lewis Riggles	Washington
Aurelius Rives Shands	Washington
Wm. F. M. Sowers	Washington
Raymond Spear	Washington
Albert L. Stavely	Washington
Isaac S. Stone	Washington
J. Ford Thompson	Washington
*George H. Torney	Washington
George Tully Vaughan	Washington
John R. Wellington	Washington
Charles S. White	Washington
William Holland Wilmer	Washington

FLORIDA

Norman M. Heggie	Jacksonville
Gerry R. Holden	Jacksonville
William James Jolly	Tampa
William Saunders Manning	Jacksonville
Carey Pegram Rogers	Jacksonville
Raymond C. Turck	Jacksonville

*Deceased

GEORGIA

F. Phinizy Calhoun	Atlanta
William E. Campbell	Atlanta
William Henry Doughty	Augusta
William Simpson Elkin	Atlanta
William S. Goldsmith	Atlanta
Ralph Montgomery Goss	Athens
Edward Groves Jones	Atlanta
Rufus R. Kime	Atlanta
William Clifton Lyle	Augusta
H. H. Martin	Savannah
Floyd Willcox McRae	Atlanta
William Perrin Nicolson	Atlanta
George Henry Noble	Atlanta
Dunbar Roy	Atlanta
Thomas Pinckney Waring	Savannah
Willis Foreman Westmoreland	Atlanta
George R. White	Savannah

IDAHO

Warner H. Carithers	Moscow
Clifford M. Cline	Idaho Falls
William F. Howard	Pocatello
Ed. E. Maxey	Boise
Charles Rothelles Mowery	Wallace
Charles Whiting Shaff	Lewiston

ILLINOIS

Frank Allport	Chicago
E. Wyllys Andrews	Chicago
Frank T. Andrews	Chicago
Charles S. Bacon	Chicago
Joseph Barnes Bacon	Macomb
Joseph Louis Baer	Chicago
E. Stillman Bailey	Chicago
Walter S. Barnes	Chicago
Channing W. Barrett	Chicago
William Louis Baum	Chicago
Charles H. Beard	Chicago
Carl Beck	Chicago
Emil G. Beck	Chicago
Joseph C. Beck	Chicago
William T. Belfield	Chicago
Edward M. Bench	Galena
Frederic A. Besley	Chicago
Charles Lorton Best	Freeport
Arthur Dean Bevan	Chicago
Carl E. Black	Jacksonville
Wallace Blanchard	Chicago
George W. Boot	Evanston
Albert I. Bouffleur	Chicago
William Edson Boynton	Chicago
Frank Brawley	Chicago
Charles H. Brobst	Peoria
Frank Wilson Brodrick	Sterling
Truman W. Brophy	Chicago

Coleman Graves Buford	Chicago
James Burry	Chicago
Henry T. Byford	Chicago
James Tweedie Campbell	Chicago
Frank Cary	Chicago
George French Strother Cary	Chicago
William E. Casselberry	Chicago
John Algernon Cavanaugh	Chicago
A. W. Chandler	Compton
Howard R. Chislett	Chicago
Robert J. Christie	Quincy
Peter S. Clark	Chicago
James Edmund Coleman	Canton
Clifford U. Collins	Peoria
William R. Cubbins	Chicago
Carey Culbertson	Chicago
Arthur H. Curtis	Chicago
William Clark Danforth	Evanston
Carl B. Davis	Chicago
Charles Davison	Chicago
Don W. Deal	Springfield
Joseph B. DeLee	Chicago
Philip Schuyler Doane	Chicago
Oscar Dodd	Chicago
Robert Dodds	Chicago
E. J. Doering	Chicago
W. A. Newman Dorland	Chicago
E. C. Dudley	Chicago
Frederick G. Dyas	Chicago
Daniel N. Eisendrath	Chicago
George L. Eyster	Rock Island
C. Gurnee Fellows	Chicago
George F. Fiske	Chicago
William H. Fitch	Rockford
Gilbert Fitz-Patrick	Chicago
Ira Frank	Chicago
Jacob Frank	Chicago
Lester E. Frankenthal	Chicago
Stanton A. Friedberg	Chicago
Emanuel Friend	Chicago
Horace Bird Frost	Chicago
William Fuller	Chicago
William Elliott Gamble	Chicago
Edwin J. Gardiner	Chicago
Edgar J. George	Chicago
Robert Tracy Gillmore	Chicago
Thomas L. Gilmer	Chicago
Stephen C. Glidden	Danville
John Ferdinand Golden	Chicago
Albert Goldspohn	Chicago
Mark T. Goldstine	Chicago
David W. Graham	Chicago
George W. Green	Chicago
Louis A. Greensfelder	Chicago
Fred A. Guthrie	La Salle
William Elton Guthrie	Bloomington
Albert E. Halstead	Chicago
Thomas Melville Hardie	Chicago
M. L. Harris	Chicago
William M. Harsha	Chicago
Burton Haseltine	Chicago
Noble Sproat Heaney	Chicago
William Hessert	Chicago
Junius C. Hoag	Chicago
Rudolph W. Holmes	Chicago
E. Fletcher Ingals	Chicago
Walter Clinton Jones	Chicago
Charles E. Kahlke	Chicago
Allen B. Kanavel	Chicago
Darwin Mills Keith	Rockford
Norman Kerr	Chicago
A. Belcham Keyes	Chicago
Oscar H. Kraft	Chicago
George N. Kreider	Springfield
Herman L. Kretschmer	Chicago
Sylvan Kunz	Chicago
Victor D. Lespinasse	Chicago
Dean Lewis	Chicago
Alfred Lewy	Chicago
William H. G. Logan	Chicago
J. Brown Loring	Chicago
Frank W. Lynch	Chicago
John Alexander Lyons	Chicago
Duncan R. MacMartin	Chicago
George Wm. Mahoney	Chicago
Ernest Mammen	Bloomington
George Paull Marquis	Chicago
John Sayre Marshall	Chicago
Franklin H. Martin	Chicago
Frank M. Mason	Rossville
L. L. McArthur	Chicago
George Martin McBean	Chicago
C. Hugh McKenna	Chicago
Frederick Menge	Chicago
A. Merrill Miller	Danville
E. L. Mitchell	Monmouth
Frank D. Moore	Chicago
Frederick B. Moorehead	Chicago
George Morgenthau	Chicago
John B. Murphy	Chicago
*W. K. Newcomb	Champaign
Robert A. Noble	Bloomington
Edward Powers Norcross	Chicago
A. J. Ochsner	Chicago
Edward H. Ochsner	Chicago
Paul Oliver	Chicago
Edmund Burt Owens	Dixon
John E. Owens	Chicago
Charles E. Paddock	Chicago
William R. Parkes	Evanston
Charles Lanphier Patton	Springfield
O. L. Pelton	Elgin

*Deceased

J. R. Pennington . . . . . Chicago
James F. Percy . . . . . Galesburg
Nelson M. Percy . . . . . Chicago
Dallas B. Phemister . . . . Chicago
Norval H. Pierce . . . . . Chicago
S. C. Plummer . . . . . Chicago
John L. Porter . . . . . Chicago
Herbert A. Potts . . . . . Chicago
George Nathaniel Pratt . . . Chicago
H. M. Richter . . . . . Chicago
Charles M. Robertson . . . . Chicago
Cassius Clay Rogers . . . . . Chicago
C. J. Rowan . . . . . Chicago
Lawrence Ryan . . . . . Chicago
Edwin W. Ryerson . . . . . Chicago
St. Elmo M. Sala . . . . . Rock Island
Louis E. Schmidt . . . . . Chicago
William E. Schroeder . . . . Chicago
Raymond G. Scott . . . . . Geneva
William N. Senn . . . . . Chicago
George E. Shambaugh . . . . Chicago
Chauncey Sherrick . . . . . Monmouth
Edward Allen Sickels . . . . Dixon
Joseph Whitefield Smith . . . Bloomington
Robert Sonnenschein . . . . Chicago
Kellogg Speed . . . . . Chicago
Charles H. Starkel . . . . . Belleville
Jeremiah H. Stealy . . . . . Freeport
William Marion Stearns . . . Chicago
D. A. K. Steele . . . . . Chicago
Charles J. Swan . . . . . Chicago
Carl Gustav Swenson . . . . . Chicago
George de Tarnowsky . . . . Chicago
William M. Thompson . . . . Chicago
Richard J. Tivnen . . . . . Chicago
Roger T. Vaughan . . . . . Chicago
Thomas H. Wagner . . . . . Joliet
Thomas J. Watkins . . . . . Chicago
J. Clarence Webster . . . . Chicago
Cassius D. Wescott . . . . . Chicago
William S. Wiatt . . . . . East St. Louis
Jonathan Leaming Wiggins . . East St. Louis
William H. Wilder . . . . . Chicago
Daniel H. Williams . . . . . Chicago
John Gordon Wilson . . . . . Chicago
Casey A. Wood . . . . . Chicago
Thomas A. Woodruff . . . . . Chicago
Samuel M. Wylie . . . . . Paxton
Gilbert H. Wynekoop . . . . Chicago
Frederick Carl Zapffe . . . . Chicago

INDIANA

Paul J. Barcus . . . . . Crawfordsville
Charles E. Barnett . . . . . Fort Wayne
John F. Barnhill . . . . . Indianapolis
L. D. Brose . . . . . Evansville
Albert E. Bulson, Jr. . . . . Fort Wayne
Edmund D. Clark . . . . . Indianapolis
William Franklin Clevenger . . . . Indianapolis
Luzerne H. Cook . . . . . Bluffton
Edgar Cox . . . . . Kokomo
William R. Davidson . . . . Evansville
Joseph Rilus Eastman . . . . Indianapolis
Thomas Barker Eastman . . . Indianapolis
William Seigman Ehrich . . . Evansville
Bernhard Erdman . . . . . Indianapolis
Benj. L. W. Floyd . . . . . Evansville
Willis D. Gatch . . . . . Indianapolis
Alois Bachman Graham . . . . Indianapolis
A. M. Hayden . . . . . Evansville
George Frank Holland . . . . Bloomington
Frank Hubert Jett . . . . . Terre Haute
Norman E. Jobes . . . . . Indianapolis
George Frederick Keiper . . . Lafayette
Bernays Kennedy . . . . . Indianapolis
Bleeker Knapp . . . . . Evansville
David J. Loring . . . . . Valparaiso
S. C. Loring . . . . . Plymouth
L. Pitt Y. McCoy . . . . . Evansville
Charles Melvin Mix . . . . . Muncie
Frank A. Morrison . . . . . Indianapolis
John Holliday Oliver . . . . Indianapolis
Everett Ervin Padgett . . . . Indianapolis
LaFayette Page . . . . . Indianapolis
Hugo Otto Pantzer . . . . . Indianapolis
Miles F. Porter . . . . . Fort Wayne
Marcus Ravdin . . . . . Evansville
Alfred P. Roope . . . . . Columbus
Maurice I. Rosenthal . . . . Fort Wayne
David Ross . . . . . Indianapolis
Charles Stoltz . . . . . South Bend
George K. Throckmorton . . . Lafayette
Ernest de Wolfe Wales . . . Indianapolis
Edwin Walker . . . . . Evansville
James Y. Welborn . . . . . Evansville
Richard B. Wetherill . . . . Lafayette
Kent Kane Wheelock . . . . Fort Wayne
Leon J. Willien . . . . . Terre Haute
William N. Wishard . . . . Indianapolis
Jonathan P. Worrell . . . . Terre Haute

IOWA

Fred F. Agnew . . . . . Independence
William L. Allen . . . . . Davenport
Fred W. Bailey . . . . . Cedar Rapids
William W. Bowen . . . . . Fort Dodge
David C. Brockman . . . . . Ottumwa
Albertus J. Burge . . . . . Iowa City
William Joseph Bussey . . . . Sioux City
James Frederick Clarke . . . Fairfield
Frank Wilson Dean . . . Council Bluffs
Lee Wallace Dean . . . . . Iowa City

G. E. Decker . . . . . Davenport
Albert B. Deering . . . . . Boone
Albert William Elmer . . . . Davenport
H. C. Eschbach . . . . . Albia
David S. Fairchild, Sr . . . . Clinton
David S. Fairchild, Jr. . . . . Clinton
Oliver J. Fay . . . . . Des Moines
Frederick E. Franchere . . . Sioux City
Harvey B. Gratiot . . . . . Dubuque
J. T. Haller . . . . . Davenport
John C. Hancock . . . . . Dubuque
Gordon F. Harkness . . . . . Davenport
Louis LeRoy Henninger . . Council Bluffs
C. S. James . . . . . Centerville
George Kessel . . . . . Cresco
Burdette Dudley La Force . . Ottumwa
Robert M. Lapsley . . . . . Keokuk
Eugene Richards Lewis. . . . Dubuque
John V. Littig. . . . . Davenport
Lawrence W. Littig . . . . Davenport
Donald Macrae, Jr. . . . Council Bluffs
Philip Benedict McLaughlin . . Sioux City
Edward Morrison Myers . . . Boone
William W. Pearson. . . . . Des Moines
Alanson M. Pond. . . . . Dubuque
Thomas Edwin Powers . . . . Clarinda
J. C. Rockafellow . . . . Des Moines
Wm. A. Rohlf . . . . . Waverly
C. E. Ruth . . . . . Des Moines
William B. Small. . . . . Waterloo
Arthur Steindler . . . . . Des Moines
Alva Porter Stoner. . . . . Des Moines
Carl William Wahrer . . . Fort Madison
John Nelson Warren . . . . Sioux City
Charles M. Werts . . . . . Des Moines

KANSAS

David Walker Basham . . . . Wichita
W. N. Bispham. . . . . Fort Leavenworth
Charles E. Bowers . . . . . Wichita
John Lillie Evans . . . . . Wichita
George Morris Gray . . . . Kansas City
J. F. Gsell . . . . . Wichita
Clifford C. Nesselrode . . Kansas City
James Edward Oldham . . . Wichita
Joseph E. Sawtell . . . . Kansas City
Mervin T. Sudler . . . . . Lawrence
Walter S. Sutton . . . . Kansas City

KENTUCKY

Irvin Abell . . . . . Louisville
Archibald H. Barkley . . . . Lexington
David Barrow . . . . . Lexington
Isadore N. Bloom . . . . . Louisville
Frank Boyd . . . . . Paducah
William Cheatham . . . . . Louisville
George S. Coon . . . . . Louisville
Louis Frank . . . . . Louisville
Henry Horace Grant . . . . Louisville
Daniel M. Griffith . . . . . Owensboro
Guy Parham Grigsby . . . . Louisville
Granville S. Hanes . . . . . Louisville
George A. Hendon . . . . . Louisville
John D. Jackson . . . . . Danville
Isaac A. Lederman . . . . . Louisville
Arthur T. McCormack . . . Bowling Green
Lewis S. McMurtry . . . . . Louisville
Wm. Barnett Owen . . . . . Louisville
Adolph O. Pfingst . . . . . Louisville
John Williamson Price, Jr. . . Louisville
J. Morrison Ray . . . . . Louisville
H. G. Reynolds . . . . . Paducah
William Owen Roberts . . . Louisville
August Schachner . . . . . Louisville
J. Garland Sherrill . . . . Louisville
C. B. Spalding. . . . . Louisville
Philip H. Stewart . . . . . Paducah
Joseph A. Stucky . . . . . Lexington
Ap Morgan Vance . . . . . Louisville
John R. Wathen . . . . . Louisville
James Tolbert Windell . . . Louisville

LOUISIANA

Louis Abramson . . . . . Shreveport
Carroll W. Allen . . . . . New Orleans
James Ashton Blanchard . . . Shreveport
Jefferson Davis Bloom. . . . New Orleans
Samuel M. D. Clark . . . . New Orleans
Henry S. Cocram . . . . . New Orleans
Lewis B. Crawford . . . . . New Orleans
Arthur W. de Roaldes . . . . New Orleans
Marcus Feingold . . . . . New Orleans
Herman B. Gessner . . . . . New Orleans
Randell Hunt . . . . . Shreveport
Otto Joachim . . . . . New Orleans
Wm. Kohlmann . . . . . New Orleans
Charles John Landfried . . . New Orleans
George B. Lawrason . . . . Shreveport
John P. Leake. . . . . New Orleans
Ernest S. Lewis . . . . . New Orleans
Robert Clyde Lynch . . . . New Orleans
Urban Maes . . . . . New Orleans
E. Denegre Martin . . . . . New Orleans
Rudolph Matas . . . . . New Orleans
Paul Avery McIlhenny. . . . New Orleans
C. Jeff Miller . . . . . New Orleans
Abraham Nelken . . . . . New Orleans
James P. O'Kelley . . . . . New Orleans
Frederick William Parham . . New Orleans
William Martin Perkins . . . New Orleans
Thomas Ragan . . . . . Shreveport
Victor C. Smith . . . . . New Orleans

JOHN SMYTH . . . . . New Orleans
WILLIAM KEENER SUTHERLIN . . Shreveport
ESPY MILO WILLIAMS . . . . Patterson

MAINE

EDVILLE GERHARDT ABBOTT . . . Portland
WILLIAM H. BRADFORD . . . . Portland
WILLIAM LEWIS COUSINS . . . . Portland
FREDERIC HENRY GERRISH . . . Portland
ERASTUS E. HOLT . . . . . Portland
ALFRED MITCHELL, JR. . . . . Portland
WILLIAM C. PETERS . . . . . Bangor
JAMES ALFRED SPALDING . . . . Portland
JOHN F. THOMPSON . . . . . Portland
HERBERT F. TWITCHELL . . . . Portland

MARYLAND

THOMAS A. ASHBY . . . . . Baltimore
WILLIAM S. BAER . . . . . Baltimore
CHARLES BAGLEY, JR. . . . . Baltimore
ROBERT PARKE BAY . . . . . Baltimore
BERTRAM M. BERNHEIM . . . . Baltimore
JOHN D. BLAKE . . . . . Baltimore
JOSEPH C. BLOODGOOD . . . . Baltimore
HUGH BRENT . . . . . Baltimore
CURTIS F. BURNAM . . . . . Baltimore
JAMES J. CARROLL . . . . . Baltimore
DEWITT BELLINGER CASLER . . Baltimore
JOHN W. CHAMBERS . . . . . Baltimore
CLYDE ALVIN CLAPP . . . . . Baltimore
EDWIN B. CLAYBROOK. . . . . Cumberland
SYDNEY M. CONE . . . . . Baltimore
THOMAS S. CULLEN . . . . . Baltimore
JOHN STAIGE DAVIS . . . . . Baltimore
S. GRIFFITH DAVIS, JR. . . . . Baltimore
GEORGE W. DOBBIN . . . . . Baltimore
JESSE WRIGHT DOWNEY, JR. . . Baltimore
SAMUEL T. EARLE, JR. . . . . Baltimore
PAGE EDMUNDS . . . . . Baltimore
J. M. T. FINNEY . . . . . Baltimore
WILLIAM A. FISHER, JR. . . . . Baltimore
HARVEY K. FLECKENSTEIN . . . Baltimore
GEORGE ALEXANDER FLEMING . . Baltimore
RICHARD H. FOLLIS . . . . . Baltimore
HARRY FRIEDENWALD . . . . . Baltimore
WILLIAM SISSON GARDNER . . . Baltimore
ARCHIBALD C. HARRISON . . . . Baltimore
ARTHUR HANSON HAWKINS . . . Cumberland
HARRY L. HOMER . . . . . Baltimore
JOHN MASON HUNDLEY . . . . Baltimore
GUY LEROY HUNNER . . . . . Baltimore
ELIZABETH HURDON . . . . . Baltimore
ELLIOTT H. HUTCHINS. . . . . Baltimore
RICHARD HALL JOHNSTON. . . . Baltimore
LUTHER HURN KELLER . . . . Hagerstown
HOWARD A. KELLY . . . . . Baltimore
MAURICE LAZENBY. . . . . Baltimore
SYLVAN H. LIKES . . . . . Baltimore
FRANK MARTIN. . . . . Baltimore
ALEXIUS MCGLANNAN. . . . . Baltimore
GEORGE WASHINGTON MITCHELL. . Baltimore
WILLIAM E. MOSELEY. . . . . Baltimore
LEONARD ERNEST NEALE. . . . Baltimore
EMIL NOVAK. . . . . Baltimore
OMAR B. PANCOAST . . . . . Baltimore
HARRY ELMER PETERMAN. . . . Baltimore
WALTER B. PLATT . . . . . Baltimore
J. DAWSON REEDER . . . . . Baltimore
ANDREW J. N. REIK . . . . . Baltimore
HENRY O. REIK. . . . . Baltimore
WILLIAM WHITALL REQUARDT . . Baltimore
EDWARD H. RICHARDSON . . . . Baltimore
MELVIN S. ROSENTHAL . . . . Baltimore
WM. WOOD RUSSELL . . . . . Baltimore
ABRAHAM SAMUELS. . . . . Baltimore
FRANK DYER SANGER. . . . . Baltimore
ARTHUR M. SHIPLEY . . . . . Baltimore
HARVEY BRINTON STONE . . . . Baltimore
WILLIAM TARUN . . . . . Baltimore
ROBERT TUNSTALL TAYLOR . . . Baltimore
GIDEON TIMBERLAKE . . . . . Baltimore
ALFRED ULLMAN . . . . . Baltimore
ALBERT JAMES UNDERHILL . . . Baltimore
GEORGE WALKER . . . . . Baltimore
J. WHITRIDGE WILLIAMS . . . . Baltimore
JOHN R. WINSLOW. . . . . Baltimore
RANDOLPH WINSLOW . . . . . Baltimore
WALTER DENT WISE . . . . . Baltimore
HIRAM WOODS . . . . . Baltimore
THOMAS C. WORTHINGTON . . . Baltimore
PEREGRINE WROTH, JR. . . . . Hagerstown
HUGH HAMPTON YOUNG . . . . Baltimore

MASSACHUSETTS

JOHN D. ADAMS. . . . . Boston
FRANKLIN GREENE BALCH . . . Boston
J. DELLINGER BARNEY. . . . . Boston
HOWARD WALTER BEAL . . . . Worcester
HOWARD P. BELLOWS . . . . . Boston
HORACE BINNEY . . . . . Boston
JOHN MATHEWS BIRNIE . . . . Springfield
CLARENCE J. BLAKE . . . . . Boston
JOHN BAPST BLAKE . . . . . Boston
JOHN TAYLOR BOTTOMLEY . . . Boston
E. G. BRACKETT . . . . . Boston
GEORGE W. W. BREWSTER . . . Boston
J. EMMONS BRIGGS. . . . . Boston
DANIEL J. BROWN . . . . . Springfield
MARTIN MILLARD BROWN. . . North Adams
ALICE G. BRYANT . . . . . Boston
AUGUSTUS W. BUCK. . . . . Fall River

Hugh Cabot	Boston
Thomas E. Chandler	Boston
Henry Melville Chase	Boston
David Cheever	Boston
Frederick E. Cheney	Boston
Arthur L. Chute	Boston
Frederick T. Clark	Westfield
Joseph Payson Clark	Boston
Farrar Cobb	Boston
Ernest Amory Codman	Boston
William Cogswell	Haverhill
Frederick Wilkinson Colburn	Boston
William M. Conant	Boston
Algernon Coolidge	Boston
Frederic J. Cotton	Boston
Clarence Crane	Boston
Eugene A. Crockett	Boston
J. H. Cunningham, Jr.	Boston
Emma V. P. B. Culbertson	Boston
Harvey Cushing	Brookline
Hayward Warren Cushing	Boston
Francis H. Davenport	Boston
Lincoln Davis	Boston
Robert L. DeNormandie	Boston
George S. Derby	Boston
Florence W. Duckering	Boston
Charles Edwin Durant	Haverhill
Albert Ehrenfried	Boston
Kendall Emerson	Worcester
Nathaniel W. Emerson	Boston
Michael F. Fallon	Worcester
William Edward Faulkner	Boston
Leo Victor Friedman	Boston
Homer Gage	Worcester
Albert Colby Getchell	Worcester
Samuel Warren Goddard	Brockton
Joel E. Goldthwait	Boston
William Goodell	Springfield
James Joseph Goodwin	Clinton
W. P. Graves	Boston
Daniel Crosby Greene, Jr.	Boston
Robert Battey Greenough	Boston
Allen Greenwood	Boston
Charles H. Hare	Boston
Francis B. Harrington	Boston
David Harrower	Worcester
John P. Hartwell	Boston
Frederick Eugene Hopkins	Springfield
Garry de N. Hough	New Bedford
Alonzo Gale Howard	Boston
Charles Tilden Howard	Boston
Walter Clarke Howe	Boston
Joshua C. Hubbard	Boston
Edward John Hussey	Holyoke
Henry T. Hutchins	Boston
Frederick William Johnson	Boston
Peer P. Johnson	Beverly
Daniel Fiske Jones	Boston
Arthur Ronald Kimpton	Boston
William Fletcher Knowles	Boston
William Edwards Ladd	Boston
Frank H. Lahey	Boston
Walter Brackett Lancaster	Boston
John W. Lane	Boston
George A. Leland	Boston
Robert Williamson Lovett	Boston
Fred B. Lund	Boston
Daniel Francis Mahoney	Boston
Stephen Andrew Mahoney	Holyoke
George Elisha May	Newton Center
William Howe Merrill	Lawrence
Charles Galloupe Mixter	Boston
Samuel Jason Mixter	Boston
William Jason Mixter	Boston
George Howard Monks	Boston
Howard Moore	Boston
Harris Peyton Mosher	Boston
Franklin Spilman Newell	Boston
Edward Hall Nichols	Boston
Daniel Paul O'Brien	New Bedford
Richard Frothingham O'Neil	Boston
Robert B. Osgood	Boston
Horace Packard	Boston
Alonzo Kingman Paine	Boston
Charles Fairbank Painter	Boston
Sarah Ellen Palmer	Boston
Luther G. Paul	Boston
Hardy Phippen	Salem
Walter Gray Phippen	Salem
Edward Marwick Plummer	Boston
Charles Allen Porter	Boston
George Herman Powers, Jr.	Boston
Alex Quakenboss	Boston
Edward Reynolds	Boston
George B. Rice	Boston
George L. Richards	Fall River
Anna Gove Richardson	Boston
Edward Pierson Richardson	Boston
Edward Hammond Risley	Boston
Mark Homer Rogers	Boston
Stephen Rushmore	Boston
Delano R. Ryder	Fall River
Jane D. Kelly Sabine	Boston
David Daniel Scannell	Boston
Charles Locke Scudder	Boston
Ralph Holland Seelye	Springfield
Walter Clark Seelye	Worcester
Channing C. Simmons	Boston
Conrad Smith	Boston
Mary Almira Smith	Boston
Winfield Smith	Boston
George Rinaldo Southwick	Boston

ROBERT SOUTTER . . . . . Boston
MYLES STANDISH . . . . . Boston
HALBERT GREENLEAF STETSON . . Greenfield
EDMUND H. STEVENS . . . . . Cambridge
HENRY BURT STEVENS . . . . Boston
JAMES S. STONE . . . . . Boston
HOWARD TOWNSEND SWAIN . . . Boston
FREDERICK BENONI SWEET . . . Springfield
MILNE BARKER SWIFT . . . . Fall River
GEORGE H. THOMPSON . . . North Adams
AUGUSTUS THORNDIKE . . . . Boston
JAMES R. TORBERT . . . . . Boston
PHILEMON E. TRUESDALE . . . Fall River
FREDERICK HERMAN VERHOEFF . . Brookline
BETH VINCENT . . . . . Boston
RICHARD G. WADSWORTH . . . Boston
DAVID HAROLD WALKER . . . . Boston
FRANCIS S. WATSON . . . . . Boston
DAVID WASHBURN WELLS . . . Boston
WM. F. WESSELHOEFT . . . . Boston
WYMAN WHITTEMORE . . . . . Boston
RALPH CLEAVES WIGGIN . . . . Cambridge
DEWITT GILBERT WILCOX . . . Boston
HUGH WILLIAMS . . . . . Boston
LEMUEL FOX WOODWARD . . . Worcester
ERNEST BOYEN YOUNG . . . . Boston

MICHIGAN

EDWARD THOMAS ABRAMS . . . Dollar Bay
EMIL AMBERG . . . . . Detroit
H. W. AUSTIN . . . . . Detroit
RALPH E. BALCH . . . . . Kalamazoo
MAX BALLIN . . . . . Detroit
JOHN NORVAL BELL . . . . . Detroit
WILLIAM GRANT BIRD . . . . Flint
ALBERT J. BOWER . . . . . Greenville
CHARLES E. BOYS . . . . . Kalamazoo
CLARK D. BROOKS . . . . . Detroit
ALEXANDER MACKENZIE CAMPBELL . Grand Rapids
DON M. CAMPBELL . . . . . Detroit
ROY B. CANFIELD . . . . . Ann Arbor
J. HENRY CARSTENS . . . . . Detroit
RAY CONNOR . . . . . Detroit
ERNEST K. CULLEN . . . . . Detroit
MARSHALL L. CUSHMAN . . . . Lansing
CYRENUS G. DARLING . . . . . Ann Arbor
C. B. G. DE NANCRÈDE . . . . Ann Arbor
WILLIAM T. DODGE . . . . . Big Rapids
GEORGE EDWARD FROTHINGHAM . . Detriot
ROBERT W. GILLMAN . . . . . Detroit
JOHN E. GLEASON . . . . . Detroit
GEORGE CLINTON HAFFORD . . . Albion
HERBERT W. HEWITT . . . . . Detroit
LOUIS J. HIRSCHMAN . . . . . Detroit
WILLARD HUNTER HUTCHINGS . . Detroit
ROBERT JAMES HUTCHINSON . . . Grand Rapids
NATHAN JENKS . . . . . Detroit
JOHN HARVEY KELLOGG . . . . Battle Creek
FREDERICK C. KIDNER . . . . Detroit
DANIEL LAFERTÉ . . . . . Detroit
ALBERT I. LAWBAUGH . . . . . Calumet
HOWARD W. LONGYEAR . . . . Detroit
IRA DEAN LOREE . . . . . Ann Arbor
JAMES A. MACMILLAN . . . . . Detroit
WALTER P. MANTON . . . . . Detroit
JOSHUA G. R. MANWARING . . . Flint
ARCHIBALD D. MCALPINE . . . . Detroit
THEODORE A. MCGRAW . . . . . Detroit
WILLIAM E. MCNAMARA . . . . Lansing
WM. FRANCIS METCALF . . . . Detriot
WILLIAM H. MORLEY . . . . . Detroit
WALTER ROBERT PARKER . . . . Detroit
ROLLAND PARMETER . . . . . Detroit
REUBEN PETERSON . . . . . Ann Arbor
LEWIS STANTON RAMSDELL . . . Manistee
HERBERT ELMER RANDALL . . . Flint
FREDERICK W. ROBBINS . . . . Detroit
DELBERT E. ROBINSON . . . . Jackson
CHARLES H. RODI . . . . . Calumet
C. H. SAMPLE . . . . . Saginaw
WALTER HULME SAWYER . . . . Hillsdale
B. R. SCHENCK . . . . . Detroit
BURT R. SHURLY . . . . . Detroit
GEORGE SLOCUM . . . . . Ann Arbor
DEAN TYLER SMITH . . . . . Ann Arbor
EUGENE SMITH . . . . . Detroit
RICHARD R. SMITH . . . . . Grand Rapids
WILLIAM ALBERT SPITZLEY . . . Detroit
HARRY N. TORREY . . . . . Detroit
HENRY J. VAN DEN BERG . . Grand Rapids
J. WALTER VAUGHAN . . . . . Detroit
FRANK B. WALKER . . . . . Detroit
F. C. WARNSHUIS . . . . . Grand Rapids
ROWLAND F. WEBB . . . . . Grand Rapids
D. EMMETT WELSH . . . . . Grand Rapids
WILLIAM KERR WEST . . . . . Painesdale
AMOS S. WHEELOCK . . . . . Goodrich
HAROLD WILSON . . . . . Detroit
FRANK C. WITTER . . . . . Petoskey
H. WELLINGTON YATES . . . . Detroit

MINNESOTA

A. W. ABBOTT . . . . . Minneapolis
FRED LYMAN ADAIR . . . . . Minneapolis
DONALD C. BALFOUR . . . . . Rochester
E. H. BECKMAN . . . . . Rochester
CHARLES BOLSTA . . . . . Ortonville
ALEXANDER J. BRADEN . . . . Duluth
THEODOR BRATRUD . . . . . Warren
FRANK E. BURCH . . . . . St. Paul
JEHIEL WESTON CHAMBERLIN . . . St. Paul
ALEXANDER R. COLVIN . . . . St. Paul

J. Frank Corbett . . . . . Minneapolis
Walter Courtney . . . . . Brainerd
William Albertus Coventry . . Duluth
W. A. Dennis . . . . . St. Paul
Robert Earl . . . . . St. Paul
John Even Engstad . . . . . Minneapolis
Carl Fisher . . . . . Rochester
Emil S. Geist . . . . . Minneapolis
Arthur J. Gillette . . . . . St. Paul
Rowland Gilmore . . . . . Bemidji
Melvin Starkey Henderson . . . Rochester
Knut Hoegh . . . . . Minneapolis
Arthur W. Ide . . . . . Brainerd
John H. James . . . . . Mankato
E. S. Judd . . . . . Rochester
Hannibal H. Kimball . . . . Minneapolis
Arthur Ayer Law . . . . . Minneapolis
Wilhelm Lerche . . . . . St. Paul
J. Warren Little . . . . . Minneapolis
Jennings C. Litzenberg . . . . Minneapolis
Archibald MacLaren . . . . St. Paul
John Silliman Macnie . . . . Minneapolis
William H. Magie . . . . . Duluth
Arthur T. Mann . . . . . Minneapolis
Justus Matthews . . . . . Rochester
Charles H. Mayo . . . . . Rochester
William J. Mayo . . . . . Rochester
James E. Moore . . . . . Minneapolis
Charles W. More . . . . . Eveleth
William R. Murray . . . . . Minneapolis
Horace Newhart . . . . . Minneapolis
Carl John Ringnell . . . . . Minneapolis
John H. Rishmiller . . . . . Minneapolis
Harry P. Ritchie . . . . . St. Paul
William E. Rochford . . . . Minneapolis
John T. Rogers . . . . . St. Paul
John L. Rothrock . . . . . St. Paul
Arnold Schwyzer . . . . . St. Paul
Gustav Schwyzer . . . . . Minneapolis
Charles N. Spratt . . . . . Minneapolis
Eugene S. Strout . . . . . Minneapolis
H. B. Sweetser . . . . . Minneapolis
Frank C. Todd . . . . . Minneapolis
Clarence Gaines Toland . . . Rochester
Charles Galen Weston . . . . Minneapolis
Harper M. Workman . . . . Tracy
Franklin R. Wright . . . . . Minneapolis

MISSISSIPPI

John Woodson Barksdale . . . Winona
Walter W. Crawford . . . . Hattiesburg
John Darrington . . . . . Yazoo City
Walter B. Dobson . . . . . Jackson
Hugh A. Gamble . . . . . Greenville
B. B. Martin . . . . . Vicksburg
Theophilus Erskine Ross . . . Hattiesburg
Harley R. Shands . . . . . Jackson
Robert L. Turner . . . . . Meridian

MISSOURI

Nathaniel Allison . . . . . St. Louis
F. W. Bailey . . . . . St. Louis
Willard Bartlett . . . . . St. Louis
J. F. Binnie . . . . . Kansas City
Vilray P. Blair . . . . . St. Louis
John Young Brown . . . . . St. Louis
George W. Cale, Jr. . . . . St. Louis
N. B. Carson . . . . . St. Louis
John Roberts Caulk . . . . . St. Louis
J. W. Charles . . . . . St. Louis
Malvern B. Clopton . . . . . St. Louis
W. T. Coughlin . . . . . St. Louis
Hanley Clay Creveling . . . St. Louis
Harry Sturgeon Crossen . . . St. Louis
Frank M. Denslow . . . . . Kansas City
Walter B. Dorsett . . . . . St. Louis
William Joseph Doyle . . . . St. Louis
Oscar H. Elbrecht . . . . . St. Louis
Arthur Eugene Ewing . . . . St. Louis
William David Foster . . . . Kansas City
William J. Frick . . . . . Kansas City
Eugene C. Gehrung . . . . . St. Louis
Jacob Geiger . . . . . St. Joseph
George Gellhorn . . . . . St. Louis
Frank A. Glasgow . . . . . St. Louis
Max A. Goldstein . . . . . St. Louis
John Green, Jr. . . . . St. Louis
J. D. Griffith . . . . . Kansas City
C. Lester Hall . . . . . Kansas City
N. O. Harrelson . . . . . Kansas City
John Gardner Hayden . . . . Kansas City
James P. Henderson . . . . Kansas City
A. E. Hertzler . . . . . Kansas City
Howard Hill . . . . . Kansas City
Roland Hill . . . . . St. Louis
Philip Hoffman . . . . . St. Louis
Alexander E. Horwitz . . . . St. Louis
Charles E. Hyndman . . . . St. Louis
Jabez N. Jackson . . . . . Kansas City
Ernst Jonas . . . . . St. Louis
H. J. Jurgens . . . . . Edina
Walter C. G. Kirchner . . . St. Louis
William Elston Leighton . . . St. Louis
Bransford Lewis . . . . . St. Louis
Hanau W. Loeb . . . . . St. Louis
Virgil Loeb . . . . . St. Louis
James E. Logan . . . . . Kansas City
Frank J. Lutz . . . . . St. Louis
Hartwell Nelles Lyon . . . St. Louis
Andrew Walker McAlester, Jr. . Kansas City
L. Clifford McAmis . . . . . St. Louis
Francis M. McCallum . . . . Kansas City

Wm. Archibald McCandless . . St. Louis
Harvey S. McKay . . . . . St. Louis
Mary Hancock McLean. . . . St. Louis
Reginald H. Meade . . . . . Kansas City
Harry M. Moore . . . . . St. Louis
Harvey G. Mudd . . . . . St. Louis
Fred T. Murphy . . . . . St. Louis
Max W. Myer. . . . . St. Louis
Clarence M. Nicholson . . . St. Louis
Frank G. Nifong . . . . . Columbia
Archer O'Reilly . . . . . St. Louis
Scott E. Parsons . . . . . St. Louis
Joseph M. Patterson . . . . Kansas City
John M. Perkins . . . . . Kansas City
Christian Frederick Pfingsten . St. Louis
Bert A. Poorman . . . . . Kansas City
Martin Hayward Post . . . . St. Louis
Francis Reder. . . . . St. Louis
W. T. Reynolds . . . . . Kansas City
William M. Robertson . . . . St. Louis
Ernest F. Robinson . . . . . Kansas City
Ernest Sachs . . . . . St. Louis
W. E. Sauer . . . . . St. Louis
Henry Joseph Scherck . . . . St. Louis
Robert Ernst Schlueter . . . St. Louis
Henry Schwarz . . . . . St. Louis
M. G. Seelig . . . . . St. Louis
Eugene Towner Senseney . . . St. Louis
Norvelle Wallace Sharpe. . . . St. Louis
William A. Shoemaker . . . . St. Louis
Greenfield Sluder . . . . . St. Louis
Carroll Smith . . . . . St. Louis
Selden Spencer... . . . . St. Louis
Percy Hypes Swahlen . . . . St. Louis
Jackson B. Taulbee . . . . . Joplin
Frederick J. Taussig . . . . St. Louis
John H. Thompson . . . . . Kansas City
Herman Tuholske . . . . . St. Louis
Paul Y. Tupper . . . . . St. Louis
Herbert G. Tureman . . . . Kansas City
William H. Vogt . . . . . St. Louis
Charles Edgar Wilson . . . . Kansas City
Ross Arlington Woolsey . . . St. Louis
Willis Young . . . . . St. Louis.

MONTANA

Henry Edward Armstrong . . Billings
John Carpenter Schapps . . . Butte
T. Casey Witherspoon . . . . Butte

NEBRASKA

Christian Alexander Allenburger Columbus
Simon C. Beede . . . . . David City
DeWitt C. Bryant . . . . . Omaha
B. B. Davis . . . . . Omaha
Palmer Findley . . . . . Omaha
Dellizon A. Foote . . . . . Omaha
Harold Gifford . . . . . Omaha
Herschel P. Hamilton . . . . Omaha
George James Haslam . . . . Fremont
August F. Jonas . . . . . Omaha
John Prentiss Lord . . . . . Omaha
Isaiah Lukens . . . . . Tekamah
Artemas I. McKinnon . . . . Lincoln
Albert R. Mitchell . . . . Lincoln
H. Winnett Orr . . . . . Lincoln
James M. Patton . . . . . Omaha
Daniel T. Quigley . . . . . North Platte
Peter Harold Salter . . . . Norfolk
John E. Summers . . . . . Omaha
Elmer J. Updegraff . . . . . Omaha
William P. Wherry . . . . . Omaha

NEW HAMPSHIRE

John M. Gile . . . . . Hanover
Robert J. Graves . . . . . Concord
Michael Edward Kean . . . . Manchester
Frank E. Kittredge . . . . Nashua
Carleton Ray Metcalf . . . Concord
Ira Joslin Prouty . . . . . Keene
Herbert Llewellyn Smith . . Nashua
Ferdinand A. Stillings . . . . Concord
George Clarence Wilkins . . Manchester

NEW JERSEY

James Spencer Brown . . . . Montclair
Talbot R. Chambers. . . . . Jersey City
Walt Ponder Conaway . . . . Altantic City
Robert Morrison Curts . . . Paterson
William Edgar Darnall . . . Altantic City
Gordon K. Dickinson . . . . Jersey City
Wells P. Eagleton . . . . . Newark
Linn Emerson . . . . . Orange
Frank D. Gray . . . . . Jersey City
James S. Green . . . . . Elizabeth
Edgar Boileau Grier . . . . Elizabeth
Philander Abbey Harris . . . Paterson
Thomas William Harvey . . . Orange
Francis Reynolds Haussling . . Newark
Ellis W. Hedges . . . . . Plainfield
Charles L. Ill . . . . . Newark
Edward Joseph Ill . . . . . Newark
Walter B. Johnson . . . . . Paterson
Emery Marvel . . . . . Atlantic City
John C. McCoy . . . . . Paterson
William Darcy Miningham. . . Newark
Clarence Ruthefford O'Crowley Newark
Mefford Runyon . . . . . South Orange
Edward Staehlin . . . . . Newark
August Adrian Strasser . . . Arlington
Sidney Arthur Twinch . . . . Newark
Norton L. Wilson . . . . . Elizabeth

NEW YORK

Robert Abbe	New York
John Lawson Adams	New York
Fred Houdlett Albee	New York
Hubert Arrowsmith	Brooklyn
Gorham Bacon	New York
Harold Capron Bailey	New York
L. Grant Baldwin	Brooklyn
Samuel Wyllis Bandler	New York
L. Bolton Bangs	New York
Calvin F. Barber	Brooklyn
Charles Clifford Barrows	New York
John Leopold Bauer	Brooklyn
Arthur J. Bedell	Albany
Edwin Beer	New York
George Huston Bell	New York
A. G. Bennett	Buffalo
T. Passmore Berens	New York
Howard Burhans Besemer	Ithaca
Frederick Bierhoff	New York
W. H. Bishop	New York
Dougal Bissell	New York
Elmer Jefferson Bissell	Rochester
Joseph Bidleman Bissell	New York
Joseph A. Blake	New York
J. A. Bodine	New York
Martin Lawrence Bodkin	Brooklyn
Arthur H. Bogart	Brooklyn
John Bion Bogart	Brooklyn
Hermann J. Boldt	New York
Milton Ralph Bookman	New York
Charles R. Borzilleri	Buffalo
William C. Braislin	Brooklyn
Robert Emery Brennan	New York
George Emerson Brewer	New York
Walter M. Brickner	New York
Wm. Barrett Brinsmade	Brooklyn
LeRoy Broun	New York
Alfred Jerome Brown	New York
Clayton Milo Brown	Buffalo
*Joseph D. Bryant	New York
W. Sohier Bryant	New York
Leo Buerger	New York
Henry G. Bugbee	New York
Carl Goodwin Burdick	New York
Lewis White Callan	New York
Peter A. Callan	New York
Wm. Francis Campbell	Brooklyn
Bukk G. Carleton	New York
Sprague Carleton	New York
Francis J. Carr	Buffalo
Alexis Carrel	New York
William Wesley Carter	New York
William Hollenback Cary	Brooklyn
P. F. Chambers	New York
George Chandler	Kingston
Walter F. Chappell	New York
Walter B. Chase	Brooklyn
Charles H. Chetwood	New York
Arthur Smith Chittenden	Binghamton
John Herbert Claiborne	New York
J. Bayard Clark	New York
Clement Cleveland	New York
Marshall Clinton	Buffalo
Gerhard H. Cocks	New York
Henry Clarke Coe	New York
Frederic Huntington Coerr	New York
Martin Cohen	New York
William B. Coley	New York
G. Kirby Collier	Sonyea
Howard Dennis Collins	New York
Leo J. J. Commiskey	Brooklyn
George Foster Comstock	Saratoga Springs
Karl Connell	New York
Royal Samuel Copeland	New York
George F. Cott	Buffalo
George W. Cottis	Jamestown
Charles Newton Cox	Brooklyn
Edwin Bradford Cragin	New York
Claude Granville Crane	Brooklyn
Walter Gray Crump	New York
H. Holbrook Curtis	New York
Arthur Ward Cutler	Oneonta
William Darrach	New York
Asa Barnes Davis	New York
William Burton De Garmo	New York
Henry Beeckman Delatour	Brooklyn
D. Bryson Delavan	New York
Edward B. Dench	New York
Paolo De Vecchi	New York
Bennett W. Dewar	Cooperstown
Robert L. Dickinson	Brooklyn
Charles N. Dowd	New York
William A. Downes	New York
James Maurice Downey	Brooklyn
Arthur B. Duel	New York
Warren L. Duffield	Brooklyn
Roger Durham	Brooklyn
J. Clifton Edgar	New York
Charles A. Elsberg	New York
Arthur Wells Elting	Albany
John F. Erdmann	New York
John Fitz-Gerald Fairbairn	Buffalo
Thomas Henry Farrell	Utica
Mathias Figueira	Brooklyn
Hermann Fischer	New York
Edwin Howe Fiske	Brooklyn
Ralph R. Fitch	Rochester
Frederick H. Flaherty	Syracuse
Austin Flint, Jr.	New York
Joseph Henry Fobes	New York
William Miller Ford	New York

*Deceased

Edgar A. Forsyth	Buffalo
Eben Foskett	New York
Matthias L. Foster	New Rochelle
Russell Story Fowler	Brooklyn
Lee Masten Francis	Buffalo
Thomas R. French	Brooklyn
Percy Henry Fridenberg	New York
Eugene Fuller	New York
Henry Dawson Furniss	New York
James A. Gardner	Buffalo
Arpad G. Gerster	New York
John C. A. Gerster	New York
Virgil P. Gibney	New York
Charles L. Gibson	New York
Gordon Gibson	Brooklyn
James H. Glass	Utica
J. Riddle Goffe	New York
Francis Colquhoun Goldsborough	Buffalo
Charles Goodman	New York
Charles H. Goodrich	Brooklyn
Onslow Allen Gordon	Brooklyn
Hermann Grad	New York
Arthur Rogers Grant	Utica
John Prescott Grant	New York
Robert H. Greene	New York
Gilbert D. Gregor	Watertown
Ramon Guiteras	New York
G. DeWayne Hallett	New York
Thomas H. Halsted	Syracuse
James Aitken Harrar	New York
James Taylor Harrington	Poughkeepsie
Burton Harris	Brooklyn
John A. Hartwell	New York
John Bruce Harvie	Troy
William H. Haskin	New York
Herman Emil Hayd	Buffalo
James Raynor Hayden	New York
Irving Samuel Haynes	New York
Harold M. Hays	New York
Charles Henry Helfrich	New York
Alfred M. Hellman	New York
William Tod Helmuth	New York
Lawrence Hendee	Buffalo
Charles W. Hennington	Rochester
Neil Jamieson Hepburn	New York
Frederick Clark Holden	Brooklyn
William Francis Honan	New York
Ransom Spafard Hooker	New York
Lucius W. Hotchkiss	New York
David W. Houston	Troy
O. Paul Humpstone	Brooklyn
Lee M. Hurd	New York
Augustus A. Hussey	Brooklyn
Clarence Reginald Hyde	Brooklyn
Arthur W. Irwin	Oswego
James Walker Jameson	New York
George W. Jarman	New York
C. Frederic Jellinghaus	New York
John Edward Jennings	Brooklyn
Albert M. Judd	Brooklyn
Adoniram Brown Judson	New York
Moses S. Kakels	New York
Frederic Kammerer	New York
Arthur Matthew Kane	New York
Frederick C. Keller	New York
Joseph Aloysius Kenefick	New York
James C. Kennedy	Brooklyn
Philip D. Kerrison	New York
E. L. Keyes, Jr.	New York
Otto G. T. Kiliani	New York
James Edward King	Buffalo
John Swartout Kirkendall	Ithaca
Frank Henry Knight	Brooklyn
William H. Wellington Knipe	New York
George William Kosmak	New York
Louis Julius Ladinski	New York
Adrian V. S. Lambert	New York
Walter Eyre Lambert	New York
Prescott LeBreton	Buffalo
John Crego Lester	New York
F. Park Lewis	Buffalo
G. Griffin Lewis	Syracuse
James Hoyt Lewis	Buffalo
Robert Lewis	New York
Howard Lilienthal	New York
Howard Edward Lindeman	New York
John Linder	Brooklyn
William Linder	Brooklyn
Samuel Lloyd	New York
Ralph Waldo Löbenstine	New York
John H. Long	Brooklyn
Ross George Loop	Elmira
Earl P. Lothrop	Buffalo
Michael Milton Lucid	Cortland
William Henry Luckett	New York
William C. Lusk	New York
Stephen H. Lutz	Brooklyn
Henry Hamilton Moore Lyle	New York
Jerome M. Lynch	New York
Robert Stevenson Macdonald	Plattsburgh
John Cowell MacEvitt	Brooklyn
James A. MacLeod	Buffalo
Grant C. Madill	Ogdensburg
George Hooper Mallett	New York
Matthew D. Mann	Buffalo
James W. Markoe	New York
Frank William Marlow	Syracuse
Wilbur B. Marple	New York
James P. Marsh	Troy
Walton Martin	New York
Francis Stuart Mathews	New York
C. H. May	New York

James Francis McCaw	Watertown
Samuel McCullagh	New York
George W. McDowell	New York
John J. McGrath	New York
Edgar R. McGuire	Buffalo
Francis W. McGuire	Buffalo
T. J. McKee	Buffalo
Descum Clayton McKenney	Buffalo
James F. McKernon	New York
Charles G. McMullen	Schenectady
S. J. McNamara	Brooklyn
Clarence A. McWilliams	New York
Willy Meyer	New York
George Kissam Meynen	Jamaica
Aaron Benjamin Miller	Syracuse
Seth Minot Milliken	New York
Henry Moffat	Yonkers
William Arthur Moore	Binghamton
John Joseph Moorhead	New York
Douglas C. Moriarta	Saratoga Springs
Jacob E. K. Morris	Olean
Robert T. Morris	New York
Albert S. Morrow	New York
Henry H. Morton	Brooklyn
Alexis V. Moschcowitz	New York
Edw. W. Mulligan	Rochester
James G. Mumford	Clifton Springs
Dwight Henderson Murray	Syracuse
Francis Wisner Murray	New York
Arthur B. Norton	New York
Frank Richard Oastler	New York
Alfred Townsend Osgood	New York
John Randolph Page	New York
*Roswell Park	Buffalo
Frederick J. Parmenter	Buffalo
Sanders McAllister Payne	New York
Charles H. Peck	New York
James Pedersen	New York
Victor C. Pederson	New York
Edward Wadsworth Peterson	New York
Wendell C. Phillips	New York
Paul Monroe Pilcher	Brooklyn
Edward W. Pinkham	New York
William Ward Plummer	Buffalo
John Osborn Polak	Brooklyn
William M. Polk	New York
Ralph Hayward Pomeroy	Brooklyn
Eugene Hillhouse Pool	New York
William Pohlman Pool	Brooklyn
John Wilson Poucher	Poughkeepsie
Henry R. Price	Brooklyn
Charles R. L. Putnam	New York
Meyer Rabinovitz	New York
John Broadfoot Rae	New York
John Francis Ranken	Brooklyn
William H. Rankin	Brooklyn
Reginald M. Rawls	New York
John Sturdivant Read	Brooklyn
Robert Grigg Reese	New York
Martin Rehling	New York
W. Scott Renner	Buffalo
Frederick G. Ritchie	New York
George W. Roberts	New York
Joseph Archibald Robertson	New York
Nathaniel Robinson	Brooklyn
Samuel Robinson	Clifton Springs
John O. Roe	Rochester
Abraham Jacob Rongy	New York
Herriot C. Rooth	Buffalo
Henry Roth	New York
Jacques Cortelyou Rushmore	Brooklyn
John D. Rushmore	Brooklyn
James I. Russell	New York
James Edgar Sadlier	Poughkeepsie
Reginald Hall Sayre	New York
John Hubley Schall	Brooklyn
Herbert Dana Schenck	Brooklyn
Gustav Seeligman	New York
Albert Eugene Sellenings	New York
Newton M. Shaffer	New York
John R. Shannon	New York
George Andrew Shepard	New York
John E. Sheppard	Brooklyn
Walter Aikman Sherwood	Brooklyn
Henry Mann Silver	New York
Harmon Smith	New York
Homer E. Smith	Norwich
Thomas Allison Smith	New York
Robert E. Soule	New York
Thomas Bray Spence	Brooklyn
J. Bentley Squier	New York
Edwin MacDonald Stanton	Schenectady
Elmer G. Starr	Buffalo
George Edwin Steel	New York
Arthur Stein	New York
Franklin M. Stephens	New York
DeWitt Stetten	New York
George T. Stevens	New York
Douglas Hunt Stewart	New York
Geo. David Stewart	New York
Ralph Alexander Stewart	New York
Lewis A. Stimson	New York
James Kirk Stockwell	Oswego
William E. Studdiford	New York
Arnold Sturmdorf	New York
John D. Sullivan	Brooklyn
Raymond Peter Sullivan	Brooklyn
Fred Barrington Sutherland	New York
Parker Syms	New York
Alfred Simpson Taylor	New York
Henry Ling Taylor	New York
Howard C. Taylor	New York

*Deceased

John J. Thomson . . . . . New York
Wm. Ross Thomson . . . . . Warsaw
Benjamin Trowbridge Tilton . . New York
Charles E. Townsend . . . . Newburgh
Wisner Robinson Townsend . . New York
Alvah H. Traver . . . . . Albany
Harry R. Trick . . . . . Buffalo
Walter Truslow . . . . . Brooklyn
Edward Emory Tull . . . . New York
Percy R. Turnure . . . . . New York
Edward Gerry Tuttle . . . . New York
H. H. Tyson . . . . . New York
Frederick Theodore van Beuren, Jr . . . . . New York
John van der Poel . . . . . New York
Albert Vander Veer . . . . Albany
Edgar A. Vander Veer . . . . Albany
James N. Vander Veer . . . . Albany
Edward Seguin Van Duyn . . Syracuse
Arthur Burton Van Loon . . . Albany
Hiram N. Vineberg . . . . . New York
Antonie P. Voislawsky . . . . New York
James Ditmars Voorhees . . . New York
Henry Albert Wade. . . . . Brooklyn
Alice E. Wakefield . . . . . New York
Ralph Waldo . . . . . New York
John B. Walker . . . . . New York
Charlton Wallace . . . . . New York
James Peter Warbasse . . . . Brooklyn
George Gray Ward, Jr. . . . New York
Wilbur Ward . . . . . New York
William Douglas Ward . . . Rochester
Alton Graham Warner . . . Brooklyn
George William Warren . . . New York
James Sears Waterman . . . Brooklyn
John Elmer Weeks . . . . . New York
Frederick Weisbrod . . . . Brooklyn
Brooks Hughes Wells . . . . New York
James Nephew West . . . . New York
Richard Ward Westbrook . . . Brooklyn
John Fonda Ward Whitbeck . . Rochester
Frederick Whiting . . . . . New York
Royal Whitman . . . . . New York
Sidney Freeman Wilcox . . . New York
Nelson W. Wilson . . . . . Buffalo
Julius Hayden Woodward . . . New York
George Woolsey . . . . . New York
Thew Wright . . . . . Buffalo
Frank Clark Yeomans . . . . New York
Frederick Wm. Zimmer . . . . Rochester
Victor Leo Zimmermann . . . Brooklyn

NORTH CAROLINA

K. P. Battle, Jr. . . . . Raleigh
Montgomery Hermann Biggs . Rutherfordton
Robert Lardner Gibbon . . . Charlotte
John Wesley Long . . . . . Greensboro
Henry Norris . . . . . Rutherfordton
Hubert Ashley Royster . . . Raleigh
James Ernest Stokes . . . . Salisbury

NORTH DAKOTA

James P. Aylen . . . . . Fargo
Robert D. Campbell. . . . . Grand Forks
Henry Herbert Healy . . . . Grand Forks
Murdock MacGregor . . . . Fargo
Alexander J. McCannel . . . Minot
Eric P. Quain . . . . . Bismarck
N. Oliver Ramstad . . . . . Bismarck
Paul Sorkness. . . . . Fargo
Henry Mason Wheeler . . . Grand Forks

OHIO

Hugh Allen Baldwin . . . . Columbus
James Fairchild Baldwin . . . Columbus
Frederick Stewart Baron . . . Zanesville
Henry A. Becker. . . . . Cleveland
Henry E. Beebe . . . . . Sidney
Daniel Albert Berndt . . . . Portsmouth
Leslie Lawson Bigelow. . . . Columbus
M. Emmett Blahd . . . . . Cleveland
Chester B. Bliss . . . . . Sandusky
Walter William Brand . . . Toledo
Charles Edwin Briggs . . . . Cleveland
Wm. Evans Bruner . . . . . Cleveland
Frank E. Bunts . . . . . Cleveland
Albert Clayton Carney . . . Hamilton
Archibald I. Carson . . . . Cincinnati
Charles Henry Castle . . . . Cincinnati
William Bricker Chamberlin . . Cleveland
Robert Barker Cofield . . . Cincinnati
George W. Crile . . . . . Cleveland
Carleton Graves Crisler . . . Cincinnati
Franklin E. Cutler . . . . . Cleveland
John Pierce DeWitt. . . . . Canton
George Balentine Evans . . . Dayton
Frank Edgar Fee . . . . . Cincinnati
Thomas Vanhook Fitzpatrick . . Cincinnati
Albert H. Freiberg . . . . Cincinnati
John V. Gallagher . . . . Cleveland
George Goodhue . . . . . Dayton
Dan Feurt Gray . . . . . Ironton
Walter Richard Griess . . . Cincinnati
Stephen S. Halderman . . . . Portsmouth
Joseph Arda Hall . . . . Cincinnati
Rufus Bartlett Hall . . . . Cincinnati
Carl A. Hamann . . . . . Cleveland
Charles Sumner Hamilton . . Columbus
William Drake Hamilton . . Columbus
Charles Melvin Harpster . . Toledo
Sol. M. Hartzell . . . . . Youngstown

Frederick C. Herrick	Cleveland
Carl R. Hiller	Cincinnati
H. H. Hines	Cincinnati
Gustav A. Hinnen	Cincinnati
Christian R. Holmes	Cincinnati
Samuel Iglauer	Cincinnati
J. M. Ingersoll	Cleveland
Julius H. Jacobson	Toledo
Robt. J. Jones	Greenfield
John G. Keller	Toledo
Lester Keller	Ironton
Cyrus A. Kirkley	Toledo
Inez Lapsley	Cincinnati
Secord H. Large	Cleveland
Edward Lauder	Cleveland
Florus Fremont Lawrence	Columbus
John Nicholas Lenker	Cleveland
William E. Lower	Cleveland
Benjamin Bush McClellan	Xenia
Wilson M. McClellan	Ashland
Gordon F. McKim	Cincinnati
Charles S. Means	Columbus
John D. Miller	Cincinnati
B. L. Millikin	Cleveland
Mark Millikin	Hamilton
Charles L. Minor	Springfield
Charles W. Moots	Toledo
Gordon Niles Morrill	Cleveland
John Wesley Murphy	Cincinnati
John Chadwick Oliver	Cincinnati
Dudley White Palmer	Cincinnati
Frank Douglas Phinney	Cincinnati
Joseph Edward Pirrung	Cincinnati
Edwards H. Porter	Tiffin
George Henry Quay	Cleveland
J. Louis Ransohoff	Cincinnati
Joseph Ransohoff	Cincinnati
William Eugene Ranz	Youngstown
Charles A. L. Reed	Cincinnati
Goodrich Barbour Rhodes	Cincinnati
Auguste Rhu	Marion
Benjamin Merrill Ricketts	Cincinnati
Robert C. Rind	Springfield
Hunter Robb	Cleveland
William King Rogers	Columbus
E. G. Rust	Cleveland
Charles Frye Sanborn	Cincinnati
Henry L. Sanford	Cleveland
Robert Sattler	Cincinnati
C. E. Sawyer	Marion
Harry M. Schuffell	Canton
Cassius M. Shepard	Columbus
*Percy Shields	Cincinnati
Roland E. Skeel	Cleveland
Harry Gordon Sloan	Cleveland
Lewis Frederic Smead	Toledo
Charles North Smith	Toledo
E. O. Smith	Cincinnati
Charles Thaddeus Souther	Cincinnati
A. F. Spurney	Cleveland
Martin Stamm	Fremont
Sigmar Stark	Cincinnati
Alexander Michael Steinfeld	Columbus
Walter G. Stern	Cleveland
Mark D. Stevenson	Akron
Gustavus A. Sulzer	Columbus
Henry Thomas Sutton	Zanesville
Magnus Alfred Tate	Cincinnati
John A. Thompson	Cincinnati
Allen B. Thrasher	Cincinnati
George Metzger Todd	Toledo
George Dwight Upson	Cleveland
Derrick T. Vail	Cincinnati
Alonzo Byron Walker	Canton
Edward Wood Walker	Cincinnati
Robert S. Walker	Toledo
Charles E. Walton	Cincinnati
Clarence Stanton Ward	Warren
Frank Warner	Columbus
John H. Weber	Akron
William Hawksley Weir	Cleveland
W. E. Wheatley	Lorain
Starling S. Wilcox	Columbus
John Murphy Withrow	Cincinnati
James Craven Wood	Cleveland
Jesse S. Wyler	Cincinnati
E. Gustav Zinke	Cincinnati
Logan B. Zintmaster	Massillon

*Deceased

OKLAHOMA

Thomas Maze Aderhold	El Reno
Abraham Lincoln Blesh	Oklahoma City
William Edward Dicken	Oklahoma City
W. Eugene Dixon	Oklahoma City
Edmund Sheppard Ferguson	Oklahoma City
Walter Hardy	Ardmore
John S. Hartford	Oklahoma City
Robert M. Howard	Oklahoma City
LeRoy Long	McAlester
Horace Reed	Oklahoma City
Ralph Vernon Smith	Tulsa
Henry Coulter Todd	Oklahoma City

OREGON

George Ainslie	Portland
Alvin W. Baird	Portland
Robert C. Coffey	Portland
John Forrest Dickson	Portland
Luther H. Hamilton	Portland
William B. Holden	Portland
Frederick A. Kiehle	Portland

Frank B. Kistner	Portland
Albert E. Mackay	Portland
Kenneth A. J. MacKenzie	Portland
Edward Bruce McDaniel	Portland
Herbert S. Nichols	Portland
Andrew Culloden Panton	Portland
Joseph A. Pettit	Portland
William Henry Skene	Portland
Andrew C. Smith	Portland
Ernest A. Sommer	Portland
Ernest F. Tucker	Portland
George S. Whiteside	Portland
Sherman E. Wright	Portland

PENNSYLVANIA

Brooke M. Anspach	Philadelphia
Theodore Burton Appel	Lancaster
Astley P. C. Ashhurst	Philadelphia
James A. Babbitt	Philadelphia
J. Montgomery Baldy	Philadelphia
John Jenkins Buchanan	Pittsburgh
James C. Burt	Pittsburgh
Sidney A. Chalfant	Pittsburgh
John G. Clark	Philadelphia
George Morrison Coates	Philadelphia
Edward P. Davis	Philadelphia
Gwilym G. Davis	Philadelphia
Ewing Wilber Day	Pittsburgh
Harry Clay Deaver	Philadelphia
John Blair Deaver	Philadelphia
William L. Estes	South Bethlehem
Curtis Smiley Foster	Pittsburgh
Melvin M. Franklin	Philadelphia
Charles H. Frazier	Philadelphia
Walter Jackson Freeman	Philadelphia
Otto C. Gaub	Pittsburgh
John Perry Griffith	Pittsburgh
George W. Guthrie	Wilkes Barre
Richard H. Harte	Philadelphia
George Livingston Hays	Pittsburgh
Edward B. Heckel	Pittsburgh
Barton C. Hirst	Philadelphia
Raleigh R. Huggins	Pittsburgh
Chevalier Jackson	Pittsburgh
John Howard Jopson	Philadelphia
James W. Kennedy	Philadelphia
D. Braden Kyle	Philadelphia
William Sterling Langfitt	Pittsburgh
Walter Lathrop	Hazleton
Robert Grier LeConte	Philadelphia
Hiram R. Loux	Philadelphia
John Bodine Lowman	Johnstown
John S. Mabon	Pittsburgh
James William Macfarlane	Pittsburgh
G. Hudson Makuen	Philadelphia
Edward Martin	Philadelphia
Stewart LeRoy McCurdy	Pittsburgh
Evan William Meredith	Pittsburgh
Harold A. Miller	Pittsburgh
Robert T. Miller, Jr.	Pittsburgh
Robert Milligan	Pittsburgh
E. E. Montgomery	Philadelphia
George P. Müller	Philadelphia
Thomas R. Neilson	Philadelphia
William Campbell Posey	Philadelphia
Wendell Reber	Philadelphia
John B. Roberts	Philadelphia
John Stewart Rodman	Philadelphia
William Louis Rodman	Philadelphia
George G. Ross	Philadelphia
Kay I. Sanes	Pittsburgh
Theodore B. Schneideman	Philadelphia
Peter N. K. Schwenk	Philadelphia
Wm. O'Neill Sherman	Pittsburgh
David Silver	Pittsburgh
Frank F. Simpson	Pittsburgh
John DeVinne Singley	Pittsburgh
E. Hollingsworth Siter	Philadelphia
Charles A. Stillwagen	Pittsburgh
Charles Francis Stokes	Philadelphia
George C. Stout	Philadelphia
George E. de Schweinitz	Philadelphia
Lorenzo W. Swope	Pittsburgh
Lewis H. Taylor	Wilkes Barre
Thomas Turner Thomas	Philadelphia
Frank Lester Todd	Pittsburgh
A. A. Uhle	Philadelphia
William B. Van Lennep	Philadelphia
Edward Aloysius Weiss	Pittsburgh
X. O. Werder	Pittsburgh
H. Augustus Wilson	Philadelphia
Alfred C. Wood	Philadelphia
James K. Young	Philadelphia
Charles Edward Ziegler	Pittsburgh
S. Lewis Ziegler	Philadelphia

RHODE ISLAND

William Bryant Cutts	Providence
William Francis Flanagan	Providence
Roland Hammond	Providence
Frederic Vinal Hussey	Providence
Arthur Thoms Jones	Providence
John W. Keefe	Providence
Patrick Henry Keefe	Providence
Lucius Kingman	Providence
Andrew Joseph McLaughlin	Providence
John W. Mitchell	Providence
Frank Edwin Peckham	Providence
Herman C. Pitts	Providence
Edgar B. Smith	Providence
Charles W. Stewart	Newport
Henry Allen Whitmarsh	Providence

SOUTH CAROLINA

Samuel Chandler Baker	Sumter
A. Johnston Buist	Charleston
Robert S. Cathcart	Charleston
Curran B. Earle	Greenville
William W. Fennell	Rock Hill
LeGrand Guerry	Columbia
Charles W. Kollock	Charleston
Leland Osgood Mauldin	Greenville

SOUTH DAKOTA

Robert Douglas Alway	Aberdeen
Francis Edgar Clough	Lead
Gilbert Geoffrey Cottam	Sioux Falls
John W. Freeman	Lead
Charles William Hargens	Hot Springs
Frank Stewart Howe	Deadwood
George I. Khieralla	Rapid City
Hiram Irving King	Aberdeen
Theodore F. Riggs	Pierre
Frederick A. Spafford	Flandreau

TENNESSEE

Richard Alexander Barr	Nashville
William T. Black	Memphis
Perry Bromberg	Nashville
W. A. Bryan	Nashville
Lucius E. Burch	Nashville
Robert Caldwell	Nashville
Chas. N. Cowden	Nashville
Joseph Augustus Crisler	Memphis
Jere Lawrence Crook, Jr.	Jackson
Marvin McTyeire Cullum	Nashville
Edward Coleman Ellett	Memphis
Duncan Eve	Nashville
Duncan Eve, Jr.	Nashville
Rufus E. Fort	Nashville
M. Goltman	Memphis
W. D. Haggard	Nashville
Eugene Michel Holder	Memphis
Battle Malone	Memphis
John M. Maury	Memphis
W. M. McCabe	Nashville
Matthew Charles McGannon	Nashville
John Lucius McGehee	Memphis
Richmond McKinney	Memphis
S. R. Miller	Knoxville
J. Lancelot Minor	Memphis
Frank David Smythe	Memphis
Raymond Wallace	Chattanooga
Hilliard Wood	Nashville

TEXAS

Horace Taylor Aynesworth	Waco
Frank Cooke Beall	Fort Worth
James Hall Bell	San Antonio
Edward Henry Cary	Dallas
Ira Carleton Chase	Fort Worth
Hugh Woodward Crouse	El Paso
Belle C. Eskridge	Houston
John Oliver McReynolds	Dallas
Samuel Edwin Milliken	Dallas
Oscar L. Norsworthy	Houston
Bacon Saunders	Fort Worth
Roy F. Saunders	Fort Worth
Arthur Carroll Scott	Temple
Charles Adna Smith	Texarkana
James Edwin Thompson	Galveston
Raleigh Richardson White	Temple

UTAH

Samuel C. Baldwin	Salt Lake City
Ralph T. Richards	Salt Lake City
Frederick Stauffer	Salt Lake City

VERMONT

Lyman Allen	Burlington
Charlotte Fairbanks	St. Johnsbury
William Stickney	Rutland
William Warren Townsend	Rutland
John Brooks Wheeler	Burlington

VIRGINIA

Richard Phillips Bell	Staunton
Lewis C. Bosher	Richmond
Samuel Cecil Bowen	Richmond
Robert C. Bryan	Richmond
Robert French Compton	Charlottesville
Wilson Elliott Driver	Norfolk
Joseph A. Gale	Roanoke
Sparrell Simmons Gale	Roanoke
Lomax Gwathmey	Norfolk
George Tucker Harrison	Charlottesville
J. Shelton Horsley	Richmond
James S. Irvin	Danville
George Ben Johnston	Richmond
Beverly Randolph Kennon	Norfolk
George Paul LaRoque	Richmond
Southgate Leigh	Norfolk
William P. Matthews	Richmond
Stuart McGuire	Richmond
Harry L. Myers	Norfolk
Levi Old	Norfolk
Robert Lee Payne	Norfolk
Robert Lee Payne, Jr.	Norfolk
W. Lowndes Peple	Richmond
Charles Russell Robins	Richmond
Hugh Henry Trout	Roanoke
Stephen H. Watts	University
A. Murat Willis	Richmond
Robert H. Wright	Richmond

WASHINGTON

Frederick William Adams	Seattle
Harry Eugene Allen	Seattle
Ivan Petroff Balabanoff	Tacoma
Frederick Bentley	Seattle
Arthur Edwin Burns	Seattle
Thomas L. Catterson	Spokane
William Columbus Cox	Everett
A. T. R. Cunningham	Spokane
James Beaty Eagleson	Seattle
Charles F. Eikenbary	Spokane
Bruce Elmore	Seattle
Robert D. Forbes	Seattle
Charles B. Ford	Seattle
Norman H. Goodnow	Everett
Alfred J. Helton	North Yakima
James Albert Moran Hemmeon	Seattle
Stuart V. R. Hooker	Seattle
George M. Horton	Seattle
Wilson Johnston	Spokane
Everett O. Jones	Seattle
William N. Keller	Tacoma
L. H. Klemptner	Seattle
O. F. Lamson	Seattle
Henry B. Luhn	Spokane
Cornelius J. Lynch	North Yakima
John A. MacKinnon	Seattle
Saxe W. Mowers	Tacoma
James M. Neff	Spokane
E. R. Northrop	Spokane
Richard J. O'Shea	Seattle
R. W. Perry	Seattle
Guy S. Peterkin	Seattle
Alfred Raymond	Seattle
James Frederick Scott	North Yakima
Walter K. Seelye	Seattle
Casper Wistar Sharples	Seattle
Hamilton Stillson	Seattle
Milton C. Sturgis	Seattle
James Sutherland	Spokane
Date K. Thyng	Tacoma
Frank J. Van Kirk	Bellingham
Archibald Clarence Veasey	Spokane
Edmund S. West	North Yakima
William F. West	Everett
Fenton B. Whiting	Seattle
Park Weed Willis	Seattle
Sherald F. Wiltsie	Seattle
Peleg Benson Wing	Tacoma
James R. Yocom	Tacoma

WEST VIRGINIA

Gregory Ackermann	Wheeling
Arthur Parker Butt	Davis
John Edgerton Cannaday	Charleston
Oswald O. Cooper	Hinton
William W. Golden	Elkins
C. S. Hoffman	Keyser
J. Ross Hunter	Hansford
Frank LeMoyne Hupp	Wheeling
Robert Jeffrey Reed	Wheeling
Jacob Schwinn	Wheeling

WISCONSIN

James Anthony Bach	Milwaukee
Milton A. Barndt	Milwaukee
George Van Ingen Brown	Milwaukee
Horace Manchester Brown	Milwaukee
Burton Clark	Oshkosh
Wilson Cunningham	Platteville
John M. Dodd	Ashland
Curtis A. Evans	Milwaukee
Edward Evans	LaCrosse
George William Fox	Milwaukee
Frederick Julius Gaenslen	Milwaukee
Henry Barnard Hitz	Milwaukee
Reginald H. Jackson	Madison
George Keenan	Madison
Charles H. Lemon	Milwaukee
John R. McDill	Milwaukee
Lewis G. Nolte	Milwaukee
Franz Pfister	Milwaukee
Lawrence H. Prince	Madison
Arthur J. Puls	Milwaukee
Philip Fletcher Rogers	Milwaukee
Robert George Sayle	Milwaukee
Gilbert E. Seaman	Milwaukee
Thomas Hall Shastid	Superior
H. A. Sifton	Milwaukee
Joseph F. Smith	Wausau
Thomas William Tormey	Madison
Frank W. Van Kirk	Janesville
Carl von Neupert, Jr.	Stevens Point
Frank S. Wiley	Fond du Lac
John Lawrence Yates	Milwaukee
Charles Zimmermann	Milwaukee

WYOMING

Herbert Taylor Harris	Basin
George L. Strader	Cheyenne

PORTO RICO

Jacinto Aviles	San Juan

DOMINION OF CANADA

ALBERTA

Edgar W. Allin	Edmonton
Harry Goodsir Mackid	Calargy
Frank Hamilton Mewburn	Calgary

BRITISH COLUMBIA

S. Bonnell	Fernie
Robert B. Boucher	Vancouver
Ivan Glen Campbell	Vancouver
Douglas Corsan	Fernie
R. V. Dolbey	Vancouver
G. C. Draeseke	Vancouver
George Sinclair Gordon	Vancouver
Oswald Meredith Jones	Victoria
J. H. King	Cranbrook
George Vernon Lockett	Vancouver
Robert E. McKechnie	Vancouver
William B. McKechnie	Vancouver
F. X. McPhillips	Vancouver
Alexander Stewart Monro	Vancouver
Francis John Nicholson	Vancouver
Harold Edward Ridewood	Victoria
Herbert W. Riggs	Vancouver
William H. Sutherland	Revelstoke

MANITOBA

Thomas Herbert Bell	Winnipeg
Wilfred A. Bigelow	Brandon
R. J. Blanchard	Winnipeg
B. J. Brandson	Winnipeg
Raymond Samuel Brown	Winnipeg
Harry Clarkson Cunningham	Carman
Herbert P. H. Galloway	Winnipeg
James Wilford Good	Winnipeg
John S. Gray	Winnipeg
John A. Gunn	Winnipeg
Jasper Halpenny	Winnipeg
Gerhard Hiebert	Winnipeg
Frank Stanley Keele	Portage la Prairie
Julius Eduard Lehmann	Winnipeg
Daniel Sayre MacKay	Winnipeg
Neil John Maclean	Winnipeg
John Sutherland Matheson	Brandon
Francis Daniel McKenty	Winnipeg
James E. McKenty	Winnipeg
William Robson Nichols	Winnipeg
S. Willis Prowse	Winnipeg
Robert Mills Simpson	Winnipeg
Stanley Alwyn Smith	Winnipeg
William Harvey Smith	Winnipeg

NEW BRUNSWICK

Alfred Bennison Atherton	Fredericton
Murray MacLaren	St. John
Wm. Donald Rankin	Woodstock
George Clowes Van Wart	Fredericton
Thomas Dyson Walker	St. John
Walter Woodworth White	St. John

NOVA SCOTIA

Henry Kirkwood MacDonald	Halifax
Philip Weatherbe	Halifax

ONTARIO

William Gardiner Anglin	Kingston
Norman Harvard Beal	London
Henry Albert Beatty	Toronto
Benj. C. Bell	Brantford
George A. Bingham	Toronto
Geoffrey Boyd	Toronto
Herbert A. Bruce	Toronto
Irving H. Cameron	Toronto
Frederick A. Cleland	Toronto
James Milton Cotton	Toronto
W. Edward Gallie	Toronto
Robert James Gibson	Sault Ste. Marie
William John Gibson	Belleville
Wilbur Howard Harris	Toronto
Arthur Clinton Hendricks	Toronto
William Belfry Hendry	Toronto
Henry Howitt	Guelph
William Warner Jones	Toronto
Edmund Eleazar King	Toronto
Angus Mackinnon	Guelph
Duncan Neil MacLennan	Toronto
W. J. O. Malloch	Toronto
Frederick William Marlow	Toronto
John Alexander McCollum	Toronto
J. H. McConnell	Toronto
Kennedy Crawford McIlwraith	Toronto
Bart E. McKenzie	Toronto
George Thomas McKeough	Cheatham
Walter McKeown	Toronto
David William McPherson	Toronto
Andrew Samuel Moorhead	Toronto
John Pettigrew Morton	Hamilton
David Edward Mundell	Kingston
Ingersoll Olmsted	Hamilton
John Roland Parry	Hamilton
A. H. Perfect	Toronto
Newton Albert Powell	Toronto
Alexander Primrose	Toronto

Richard A. Reeve	Toronto
James A. Roberts	Toronto
Lorne Forbes-Robertson	Stratford
E. Stanley Ryerson	Toronto
George Sterling Ryerson	Toronto
Wallace Arthur Scott	Toronto
Edwin Seaborn	London
Edward Reginald Secord	Brantford
Norman S. Shenstone	Toronto
Gideon Silverthorn	Toronto
Jane P. Sproule	Toronto
Clarence L. Starr	Toronto
Frederic Newton Gibsorne Starr	Toronto
Benjamin Philp Watson	Toronto
Hadley Williams	London
David James Gibb Wishart	Toronto
John Wishart	London
Arthur Wright	Toronto

QUEBEC

Edward William Archibald	Montreal
George E. Armstrong	Montreal
Walter L. Barlow	Montreal
Alfred Turner Bazin	Westmount
Herbert Stanley Birkett	Montreal
Harry Clifton Burgess	Montreal
Kenneth Cameron	Montreal
Roland Playfair Campbell	Montreal
Walter W. Chipman	Montreal
John Munro Elder	Montreal
Frank Richardson England	Montreal
Romulus Falardeau	Montreal
Alexander McKenzie Forbes	Montreal
Alexander Essehnont Garrow	Montreal
Donald Alexander Hingston	Montreal
James Alexander Hutchison	Montreal
Wm. Hutchinson	Montreal
Campbell B. Keenan	Montreal
Herbert Melville Little	Montreal
Frederick A. L. Lockhart	Montreal
William Warren Lynch	Sherbrooke
Oscar Felix Mercier	Montreal
Harold S. Muckleston	Montreal
John Appleton Nutter	Montreal
Frank Stewart Patch	Montreal
Zephyr Rheaume	Montreal
James T. Rogers	Montreal
Eugene St. Jacques	Montreal
John W. Stirling	Montreal
Frederic Thomas Tooke	Montreal
William George Turner	Montreal
Edmond Melchior von Eberts	Montreal
Edward Johnston Williams	Sherbrooke

SASKATCHEWAN

Malcomb Edward MacKay	Paynton

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS IN SURGERY

By M. G. SEELIG, M. D.

SOMEHOW or other, as the books come in for review, month after month, one may sense a common purpose characterizing them—a purpose oftentimes more or less indefinite and indeterminate, and yet sufficiently well marked to make its presence felt. For example, this month there is an air of the encyclopædic about the review table, an almost bewildering attempt to crowd into small compass the accumulated knowledge of lands and ages.

The work on Pain,[1] by Behan, illustrates particularly well this encyclopædic tendency. Never before has such a treatise on pain been written. As an example of patient plodding through literature, careful correlation of data, philosophic deduction, and of completeness, it has every stamp and earmark of a classic. These very characteristics indeed mark it off, and set it apart, in a different class from that other great classic on pain, written by Hilton in 1877. Let anyone who finds himself interested, abstractly or concretely, in the subject of pain, pick up the Index to the Surgeon-General's Library and turn to the heading *Pain*. If the string of titles that greets his gaze does not totally confound him, it may force him to realize the enormity of the task that Behan set for himself when he started collecting his notes.

To attempt to review the book with any degree of manifest intelligence is in itself a task, bearing in mind limitations of space. To be at all adequate, a review of so many congregated facts should smack of the lengthy criticisms written by eminent philologists when new dictionaries are published; but about the best way to furnish the reader a reasonable idea of the book is to abstract for him the table of contents. There are, in all, thirty-five chapters, opening with a discussion of the psychology of sensation, followed by six chapters on the nature of pain, the distribution, perception, classification of, and intensity of pain. Then follow five chapters on pain in diseases of the brain, cord and nerves, pain in the tissues, bone pains, and pains caused by the glandular and circulatory systems. The next chapter introduces the subject of regional pain, and is followed by a discussion, in four chapters, of pains caused by diseases of the eye, ear, nose, and throat. The next twelve chapters discuss abdominal pain, first in general, and then under the head of the various abdominal viscera. Pain due to the male and female generative organs occupies two chapters, and is followed by the three closing chapters on pains in the chest and in particular those referable to the heart and lungs.

By way of broad generalization one may say that practically anything that he desires to know about pain he will find adequately described, clearly referred to in an excellent index, and conveniently classified in a most complete bibliography. Occasionally one notes here and there a lapse, as for instance the failure to mention Meltzer and Auer's work on the sensibility of the peritoneum and the crediting (by a misprint) of Sluder's work on the sphenopalatine ganglion to Sueder. But if one desires to know about the work of Head and Sherrington and Holmes on epicritic, protopathic and deep sensibility, or about Lennander's work on the peritoneum, or of the innervation of the bladder, or of the cord tracts transmitting sensibility, or, for that matter, of any of the basic fundamental physiological or clinical phenomena of pain, he will find clear and accurate summaries or restatements, thus sparing himself the task of going to original sources.

Of course, all that we have said so far, merely confirms our introductory statement that the book is encyclopædic, and this in turn means that it is not readable, in the sense that one reads an ordinary medical book. There is so much refinement of classification and so much wealth of detail that assimilation is simply impossible. The author's attempt to classify pains due to the appendix, for example, leads both him and his reader into a snarl of complexity.

For the most part the illustrations are excellently clear and diagramatic. One cannot help guessing at the author's purpose in inserting art photos of voluptuous young women, totally nude, evidently complacently free from pain, posed in enticingly æsthetic postures and labeled "Pain on going upstairs," "Lacing shoes posture," "Pain on hyperextension," etc. But, after all, one really enjoys the ease with which he interprets such pictures as contrasted with the difficult interpretation of the modern secessionist and cubist art cults.

[1] PAIN, ITS ORIGIN, CONDUCTION, PERCEPTION AND DIAGNOSTIC SIGNIFICANCE. By Richard J. Behan, M. D., New York and London: D. Appleton & Co., 1914.

ONE would naturally expect a treatise on pain to be encyclopædic, for the simple reason that the subject lends itself easily to such treatment. What shall we say, however, to an author who purposes to describe a method of nephropexy,[1] and then sets about accomplishing his purpose by first describing fifty-odd different methods in detail? Such is the method pursued by Luzoir, who, in addition, reports various discussions held on the subject of nephropexy before the French Association of Urology and the New York Surgical Society.

The Albarran-Marion method of performing nephropexy is described as follows:

1. Curved lumbo-abdominal incision.
2. Grasp the fatty capsule as far posteriorly as possible, and incise it.
3. Free the kidney from all adhesions and deliver it.
4. Incise the true capsule along the convex border, from the upper pole, to within two fingers of the lower pole.
5. Strip back the capsule on both sides and by incising each half of the capsule transversely, make four flaps of the capsule.
6. Transfix the base of each of these flaps with a number three catgut suture and knot the suture in place.
7. The two upper sutures are passed through the tenth interspace, and there knotted in place. This gently draws the kidney up under the ribs.
8. The two lower flaps of capsule are then transfixed with sutures, as were the upper ones, these sutures being sewed into the deep surface of the loin muscles.
9. The fatty capsule is tucked under the lower pole of the kidney and held there by a catgut suture.
10. The loin wound is closed around a small drain.

When we have mastered this technique we have abstracted the substance from the book. Of course, one cannot wilfully and deliberately choke off all admiration for such an excellent résumé of the literature as Luzoir presents; but most of us have so thoroughly surfeited of the broad general question of ptosis, and in particular of nephroptosis, that it is necessarily a burden to have to wade in afresh.

The book serves one excellent purpose; namely, that it is a storehouse of information for anyone who has the inclination, properly re-enforced by the necessary endurance, to investigate the question of nephropexy from earliest times down to the present.

[1] De la Nephropexie, Procédé d'Albarran-Marion. Par Dr. Jules Luzoir. G. Steinheil, Paris, 1913.

AND here, finally, is the real encyclopædia, concealed by fate under the name of "Annual,"[2] and treating of everything, in alphabetical order, from acitrin to yellow fever. These volumes have been appearing for thirty-two years; it would be presumptious, therefore, to say that they do not serve at least some utilitarian purpose. Indeed it is fairly easy to conceive of men, far removed from the library facilities of urban centers, patiently waiting for the appearance of their annual "Annual" in order to post themselves on the medical happenings of the past twelve months. Of course, a much more satisfactory, even if a bit more strenuous, method of accomplishing the same purpose would be to subscribe to one or two good medical weeklies.

To men who are accustomed to digesting their medical literature and arriving at their own critical judgments, there is something rasping, even partially offensive in a scantily skimmed abstract of the year's product — something that arouses a mild spirit of revolt akin to that felt by the medical teacher against the innumerable half-baked quiz compends published for lethargic students. Such volumes always have a perfunctory tone, a sort of set task atmosphere that must be more or less disquieting to every reader except him who really does wait for his Annual. It is all such evident hack work. Take, for example, that portion of the Annual devoted to stomach and duodenum. It is done by Sir Berkley Moynihan in the very short compass of five and half pages, and mirrors neither the spirit nor the body of Sir Berkley, without charm, without grace, and what is more important, without criticism. And it is to this that we object, not to the fact that the work is an encyclopædia, or that it abstracts literature. The *Real Encyklopædie* of the Germans, and a work like our own Progressive Medicine, which is frankly an abstract journal, are valuable contributions to medical literature despite their encyclopædic character.

We would not have it assumed, however, that our criticism is totally destructive, for there is not a little to commend the volume. The contribution of Professor Von Noorden on thorium and that of Dr. Lawrason Brown on tuberculin therapy are excellently complete and specific. Dr. Purves Stewart writes very fully of tetanus, and the article on syphilis by C. F. Marshall furnishes a good review of progress. Of course, we realize that if all the articles in the book had conformed in scope to those above mentioned, a one-volume work would have been out of the question, but even so, we cannot see much of unqualified value in the pretentious condensation aimed at in this Annual.

[2] The Medical Annual, A Year Book of Treatment and Practioners Index. Bristol: John Wright & Sons, Ltd., 1914.

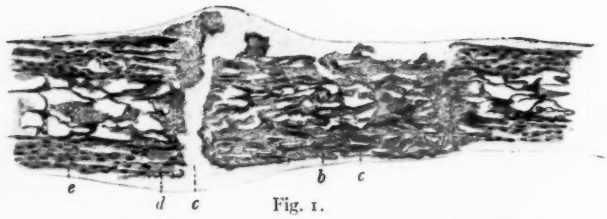


Fig. 1. 132 day Exp. No. 107. Transplant with periosteum on.
a. Old dead cortex.
b. New bone.
c. Fibrous intermediary callus
d. End of fragment with dead cortex.
e. Living cortex.

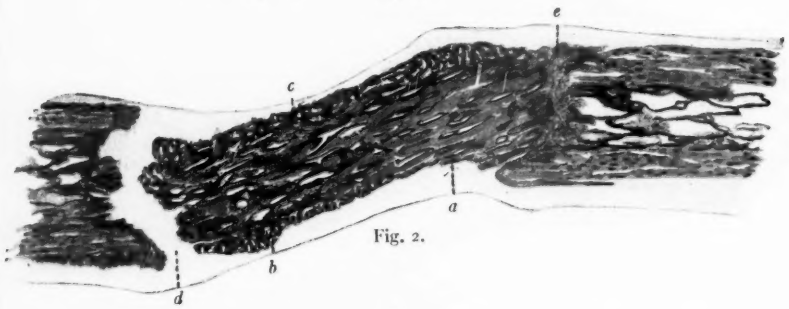


Fig. 2. 64 day Exp. No. 153. One half of the shaft split longitudinally; periosteum and endosteum on.
a. Old dead cortex.
b. New bone from periosteum.
c. Extensive new bone from endosteum.
d. Fibrous intermediary callus above.
e. Bony union lower end.

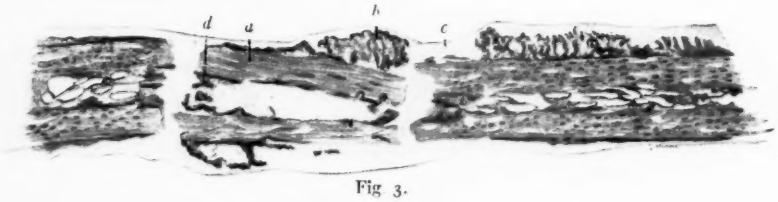


Fig. 3. 40 day Exp. No. 111. Periosteum on transplant, but cut from ends of fragments.
a. Dead cortex, no substitution.
b. New periosteal bone.
c. Fragment end with only a trace of callus.
d. Bony medullary callus.

Fig. 4. 109 day Exp. 144 L. Periosteum removed from transplant and fragment ends.
a. Old cortex, lacunæ volant.
b. New bone.
c. Intermediary callus, upper end.
d. Bony union, lower end.
e. Dead cortex of fragment end, largely substituted.

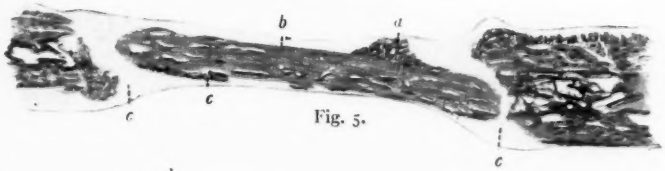


Fig. 5. 46 day Exp. No. 176. Periosteum and endosteum both removed.
a. Callus formed on transplant from surviving cells.
b. Dead cortex.
c. Fibrous intermediary calluses

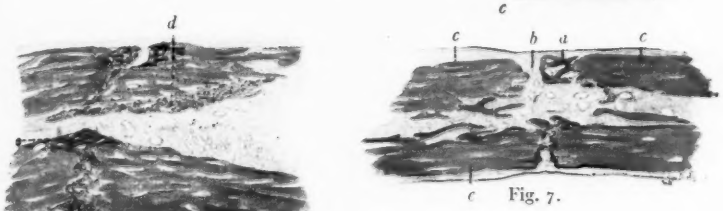


Fig. 6. 46 day Exp. 161 R. Showing rapid bony union of fracture through a transplant with periosteum and endosteum on.
a. Bony periosteal callus.
b. Bony endosteal callus.
c. Bony intermediary callus.
d. Cortex with cells dead.

Fig. 7. 87 day Exp. 173 L. Showing delay in union of fracture through a transplant with its periosteum removed.
a. Bony callus forming from ends of cortex.
b. Fibrous tissue connecting the ends.
c. Cortex with its cells all dead.